CHERNEws

Internal information bulletin of the CHERNE network

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Editors: I. Gerardy, F. Tondeur

CONTENTS

1. CHERNE activities of the next semester (Jan.-May 2016)

Two courses at UP Valencia

UPV offers to the students of the CHERNE network the possibility to follow two one-week courses. Applications (**before April 10**) and requests for more information should be sent to Prof. Rodenas jrodenas@iqn.upv.es . A certificate of participation will be delivered (with a grade if an exam is passed) to the students having missed at most one lecture.

Methods and applications in Radiochemistry

prof. U. Scherer, HS Mannheim, Germany

25-29 April 2016

Radioactive materials play an important role in many areas of science and technology. Some of our most pressing problems in nuclear energy production are connected to the chemical properties of radionuclides, e.g. the waste management problems.
On the other hand, the multitude of applications of the tracer technique has provided us until now with important insight e.g. in biochemistry and physiology and is being applied every day in medicine to diagnose and treat diseases.

This course attempts to provide some basic information to students of chemistry and chemical engineering on the principles of Nuclear Chemistry and how they are applied in many disciplines.

This course can be completed by a lab class provided as a summer school in the framework of the CHERNE network

Lectures can be divided in the following chapters:

1. *Carrier and Tracers*
2. *Sources of Radionuclides*
3. *Decontamination*
4. *Protective Techniques*
5. *Radiolabelling*
6. *Radiotracer Applications*
7. *Radioanalytical Methods*
8. *Radiochemical Separation Techniques*
9. *X-Ray Fluorescence Analysis*
10. *Transuranium Elements*

***Prerequisites**:*
The students should have a basic knowledge of chemistry, chemical engineering and nuclear engineering.

Formation, Acquisition and Processing of Images in Nuclear Medicine Techniques

Prof. I. Lopes, U. Coimbra, Portugal

9-13 May, 2016

I – Introduction: basics of imaging formation in Nuclear Medicine Techniques (2 hours)

1.1 Radioisotopes and radiotracers

1.2 Emission process and the image formation

1.3 Information conveyed by images provided by Nuclear Medicine Techniques

1.4 Short presentation of the different imaging Nuclear Medicine Techniques: scintigraphy (or planar nuclear imaging), single photon emission tomography (SPECT) and positron emission tomography (PET).

1.5 Brief comparison between nuclear medicine imaging techniques and radiological imaging (radiography and computed tomography).

II - Image quality (2 hours)

2.1 Introduction

2.2 Position resolution

2.3 Contrast

2.4 Signal to noise ratio

2.5 Artifacts and distortions

III – Image acquisition in planar nuclear imaging and SPECT (2 hours)

3.1 Gamma camera: the basic planar nuclear imaging system

3.1.1 Working principle and readout
3.1.2 Components of gamma camera
3.2 Collimators
3.2.1 Parallel hole collimator: characterization
3.2.2 Other types of collimators
3.2.3 How the collimators influence the image

3.3 Performance assessment: image quality

3.4 Methods of Data Acquisition: frame and list modes

IV – Image acquisition in Positron Emission Tomography (PET) (2 hours)

4.1 Principles

4.2 Instrumentation

4.3 Data Analysis prior reconstruction

4.4 PET/CT

V – Image reconstruction in tomography (4 hours)

5.1 Basis concepts: projection, linear integral, list form and sinogram

5.2 Fourier transforms and Fourier slice theorem

5.3 Filtered backprojection method

5.4 Iterative image reconstruction algorithms

5.5 Artifacts in the reconstructed images.

VI – Digital Imaging Processing: introduction (2 hours)

6.1 Digital images: sampling and quantization

6.2 Aim of image processing; Differences between image processing, analysis and computer vision.

6.3 Some basic tools for digital image processing

VII – Digital processing techniques in the spatial domain (4hours)

7.1 Point processing techniques: transformation functions for contrast enhancement, threshold, negative image, gray-level slicing

7.2 Histogram equalization technique

7.3 Filters, masks and windows

7.4 Image smoothing

7.5 Image sharpening

7.6 Edge detection: Roberts and Sobel operators

7.7 Noise reduction

7.8 Segmentation

VIII- Digital processing techniques in the frequency domain (2 hours)

2. CHERNEws is your bulletin

All CHERNE members are invited to send short communications, related to the CHERNE objectives, which they believe interesting for the other members. CHERNE objectives are described in the CHERNE declaration on www.upv.es/cherne .

Here you can announce conferences, job offers, call for partners for your projects …

Send your text to both editors gerardy@isib.be, tondeur@isib.be .