

## WHY STUDY RADIOECOLOGY?

- There is an urgent need for university trained candidates within radioecology in Europe.
- Radioecology or environmental radioactivity is the science that forms the fundament for assessing risks of radioactivity to humans and the environment.
- Radioecology deals with a continuum that starts with releases of radionuclides from a source, continues through the dispersal and retention of the contaminants by various transport and transfer processes, and ends with the determination of dose to be used to assess risks to human populations and to ecosystems.

## TARGET GROUP

The main target group will be the doctoral students and research workers, but also the students at the Master level.

## POTENTIAL WORKING POSITIONS

The Radioecology course will also be of relevance to those who wants to work within:

- the nuclear industry and nuclear fuel cycle operations
- environmental regulation and management (ministries, directorates)
- radiation protection authorities.
- non-nuclear industries with radioactivity in raw materials and releases (oil and gas industry, road construction, mining industry, forestry, etc)
- decommission of nuclear facilities
- nuclear waste storage
- radioactive contamination and clean-up, remediation

The Radioecology course will also be of relevance for those who want to:

- Pursue PhD programmes within nuclear sciences
- Apply for research positions at institutions with research programs within nuclear and environmental sciences

NORWEGIAN UNIVERSITY OF LIFE  
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[www.umb.no](http://www.umb.no)

## COURSE RESPONSIBLE

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## CINCH

Cooperation In education in  
Nuclear Chemistry

[www.cinch-project.eu](http://www.cinch-project.eu)

Project Leader

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CINCH is and EU 7<sup>TH</sup> Framework Programme project within EURATOM aiming to coordinate nuclear chemistry education and training in Europe.

The project includes the formation of a long-term EURATOM Fission Training Scheme (EFTS) providing a common basis to the fragmented activities in this field and thus move the education and training in nuclear chemistry to a quantitatively new level.

THE UNIVERSITY IS AN OPPORTUNITY, SEIZE IT  
L'UNIVERSITÉ EST UNE CHANCE, SAISISSEZ-LA

# R A D I O E C O L O G Y



NORWEGIAN UNIVERSITY  
OF LIFE SCIENCES  
(UMB)  
&  
CINCH  
Consortium

## RADIOECOLOGY COURSE

MASTER (MSc) AND PHD LEVEL  
&  
TRAINING COURSE

8<sup>TH</sup>-19<sup>TH</sup> OCTOBER 2012  
ÅS, NORWAY



# RADIOECOLOGY COURSE

## OBJECTIVES

After the course the students should have basic knowledge in radioecology and be able to conduct experimental radioecological studies. In order to accomplish this they need to acquire knowledge of:

- Radioactive sources and understand the transport of radioactive substances in various ecosystems with special focus on physical-chemical forms (speciation) and their influence on mobility and biological uptake
- The basis for environmental impact and risk assessments and be able to conduct radioecological studies using tracer techniques, radiochemical separation techniques and advanced measurement methods
- Environmental impact and risk assessments and the use of effective countermeasures, i.e. competence that is needed within national preparedness associated with radioactive contamination

The students will learn to think critically and solve complex and multidisciplinary problems, as well as learn to accurately interpret current research literature.

## ARRANGEMENT, CREDITS, LANGUAGE

The course runs over 2 weeks (October 8<sup>th</sup>- 19<sup>th</sup>) in Aas (30 min by train South of Oslo), Norway. The course will combine lectures and 4 laboratory exercises, it will be worth 5 ECTS. An obligatory deliverable will be a filled-in lab report form. All teaching will be in English.

## ADMISSION REQUIREMENTS

In order to apply for admission to join the courses, please contact Lindis Skipperud ([lindis.skipperud@umb.no](mailto:lindis.skipperud@umb.no)) to obtain a registration form. The form together with this brochure are available also on the CINCH web page <http://www.cinch-project.eu/?art=courses>. A limited budget exists to support students and young researchers. Application deadline is October 1<sup>st</sup>.

## ACCOMMODATION

Rooms at Campus Aas, 30 km South of Oslo or in nearby hotels. If accommodation (student housing) is needed, please contact [lindis.skipperud@umb.no](mailto:lindis.skipperud@umb.no) as soon as possible.

# COURSE PROGRAMME OCTOBER 8 – 19<sup>TH</sup>, 2012

Lectures CA 31 HOURS
Introduction: Speciation of radionuclides in the environment, radioecological aspects
Radiochemistry, NAA, Advanced methods, Tracer techniques, Nuclear forensics
Nuclear fuel cycle; Past present and future sources of radionuclides in the environment
NORM sources
NORM: dose assessment and countermeasures
Chernobyl and Fukushima accidents
Radioactive particles, characteristics and potential impact
Assessing impacts of ionizing radiation to non-human biota
Biological effects of ionizing (mechanisms, non-targeted effects, multiple stressors, biomarkers)
Terrestrial radioecology, Food chain transfer Countermeasures
Freshwater radioecology including modelling
Radionuclides in the Marine environment, modelling
Preparedness, Environmental security

## ADDITIONAL INFORMATION SOURCES

<http://www.umb.no/english/>

<http://www.cinch-project.eu/>

<http://www.umb.no/about-umb/article/how-to-find-the-university>

[http://statisk.umb.no/nlh\\_english/mapjpg.htm](http://statisk.umb.no/nlh_english/mapjpg.htm)

Laboratory exercises CA 25 HOURS
Lecture: Introduction to laboratory exercises
Tracer experiments (water, sediment, mussels, plants, 96 hrs exposure), $K_d$ , CR, uptake and depuration kinetics
Speciation - water: Size/charge fractionation techniques
Speciation - sediments: Sequential extraction techniques
Digital autoradiography of contaminated experiments and organisms
Lab. Demo: Electron microscopy/Particle identification and characterization
Other exercises CA 4 hours
Case study: Preparedness and countermeasures
Filled-in laboratory report form

