Why study Radioecology?

- There is an urgent need for university trained candidates within radioecology
- 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.

Potential Working Positions

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

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

CERAD
Norwegian University of Life Sciences NMBU, N-1432 Aas
Norway
www.nmbu.no

COURSE REPONSIBLE

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CERAD: Centre of Environmental Radioactivity (CERAD CoE) is a Centre of Excellence based at NMBU, financed by the Norwegian Research Council and headed by Prof. Brit Salbu.

An essential ingredient in CERAD is researcher training and education (MSc, PhD) to provide an internationally attractive research environment, and to produce candidates that are inter-nationally competitive. The EU supported MSc in Radioecology is unique in Europe. International collaboration on education in Radioecology has been initiated with e.g. Fukushima University and National University of Life and Environmental Sciences of Ukraine, forming a useful recruitment base for PhD education. All courses are given in English and some courses are run intensively to make access possible for students from all over Europe as well as overseas.

CERAD arrange a number of MSc and PhD courses, all in English, of which the majority will be open to participants outside of NMBU/CERAD.

Since radioecology is a multidisciplinary science, students (MSc, PhD) in radioecology have a wide range of future carrier opportunities, and one of our goals is to put students in contact with potential employers and research projects, as well as to ensure that training and education in radioecology meets the needs of those employers.

Radioecology

Norwegian University of Life Sciences (NMBU)

Courses in Radioecology (MSc and PhD level)

1. Experimental radioecology (10 ects)
2. Radioecology (5 ects)

10th-27th January 2017
Ås, Norway

RADIOECOLOGY COURSES

Experimental Radioecology (10 ECTS)

Lectures, Lab exercises, term paper

Radioecology (5 ECTS)

Lectures, Lab exercises

Objectives

After the course the students should have an overview over 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 physico-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
- How to prepare and deliver effective oral and written presentations of technical information and scientific results.

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 courses run in parallell over 3 weeks (Jan. 10th- 27th, 2017) in Aas (30 min by train South of Oslo), Norway. Lectures and 4 laboratory exercises are the same for the 2 courses. The course Radioecology (5 ECTS) only requires participation in the laboratory work and a short lab report form, whereas the Experimental Radioecology (10 ECTS) includes an extensive lab report and a term paper. All teaching will be in English.

Admission Requirements

In order to apply for admission to join the courses please contact Ole Christian Lind (olelin@nmbu.no) to obtain a registration form. Pre-Registration/Intention to participate deadline: As soon as possible. Deadline to register and apply for admission as guest student: December 1st, 2016.

Accommodation

Rooms at Campus Aas, 30 km South of Oslo or in nearby hotels. Request to mirian.wangen@nmbu.no for cheap accommodation as soon as possible.

Course Programme Radioecology, January 10th – 27th, 2017

Lectures Ca 40 hours	Laboratory Exercises and demonstrations Ca 26 hours
Introduction: Speciation of radionuclides in the environment, radioecological aspects	Lecture: Introduction to laboratory exercises
Radiochemistry, nuclear chemistry, radioanalytical techniques, tracer and dating techniques	Mesocosm experiments - Cf, Kd, kinetics (Fresh water, shrimps, snails, plants, 70 hours exposure)
Nuclear fuel cycle; Past, present and future sources of radionuclides in the environment	Sequential extractions
TENORM, gamma and Rn dose assessment	Size/charge fractionation
NORM/TENORM with examples from Norway	Digital autoradiography of contaminated sediments and organisms
The Chernobyl and Fukushima accidents	Lab. Demo.: Electron microscopy/Particle identification and characterization
Radioactive particles	**Other exercises Ca 4 hours**
Assessing impacts of ionizing radiation to non-human biota	Case study: Preparedness and countermeasures
Biological effects of ionizing radiation to non-human biota (mechanisms, biomarkers)	**Obligatory deliverables (10 ECT Course)**
Terrestrial radioecology/Countermeasures	Extensive laboratory report (ca 20 pages)
Radionuclides in the Aquatic Environment	Term paper (ca 15 pages)
Modelling in Radioecology	**Obligatory deliverables (5 ECT Course)**
Preparedness, Environmental security	Laboratory report (ca 10 pages)
Summary of the courses	