Master Radioecology
Environmental risk from radioactive nuclides

The Isotope Laboratory at UMB, established 1952
Master

Radioecology

Environmental risk from radioactive nuclides

Why Radioecology?

- EU and OECD have identified an urgent need of university trained candidates within nuclear sciences, including radioecology, in Europe and world-wide.

- Radioecology is a key research area linking authorized or accidental releases from nuclear sources to impact and risk assessments and to the radiation protection of man and the environment.

- The establishment of public confidence in nuclear technologies and industries will depend upon the availability of well-educated personnel and independent experts/advisors within the fields of radiochemistry, radioecology and radiation protection.

What can you use this qualification for? The programme provides the competence to a wide range of positions related to authorities responsible for the national legislation and the nuclear energy industry e.g., within ministries, directories, governments, services, development projects, technical support and consultancy, management, environmental protection, as well as within institutions responsible for research and education.
**Contents of the programme**  In a diverse learning process, you will gain knowledge about radioecology; behaviour of radionuclides in the environment, as well as impact and risk assessment based on radiochemistry and radiation protection, the nuclear industry and waste management, project management and research methods.

Skills in these areas are required not only to deal with currently installed nuclear capacity and decommissioned facilities, but also to meet the needs presented by likely new-build nuclear installations. The pressures are facilitated by new improved and safer reactor systems that are being developed in Europe and the USA. Therefore, the need for nuclear competence is probably greater today than was earlier anticipated.

**The teaching**  Your learning will be based on intensive courses, laboratory work, group work, real-life case studies and thematic thesis with interdisciplinary approach, and through reflection on links between real-life situations and theory. To secure that the education is scientifically based, teachers from Europe will contribute with their special competence.

**Study program structure**  The first year provides basic course modules as well as the initiating of the research project; the second year is dedicated to advanced course modules together with data collection and analysis, i.e. finalizing the thesis.

The course modules will be held at UMB and at collaborating European universities.

**Requirements for application**  Bachelor’s degree (BSc), a Norwegian “cand. mag.” degree, or equivalent education in any field relevant to the environment (e.g. chemistry, ecology, biology, resource management, agriculture, environmental sciences, environmental engineering, geography etc.). Applicants must demonstrate English language ability in accordance with UMB regulations for programmes taught in English.

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**For more information**

- Information about application and general questions about the study: Student Information Office, P.O. Box 5003, 1432 Aas, Norway phone: +47 64 96 59 72 / 73, e-mail: opptak@umb.no

- More information about the courses: Department of Plant and Environmental Sciences P.O. Box 5003, 1432 Aas, Norway phone: +47 64 96 55 40 e-mail: ipm@umb.no http://www.umb.no/ipm

- Study Coordinator Ingrid Bugge, phone: +47 64 96 55 25 e-mail: ingrid.bugge@umb.no

- Scientific contact person: Lindis Skipperud phone: +47 64 96 55 46 e-mail: lindis.skipperud@umb.no

- Project responsible: Professor B. Salbu
## Study Plan

### European Master in Radioecology, Course Modules and Time Schedule

<table>
<thead>
<tr>
<th>Modules</th>
<th>Course ID</th>
<th>Titles of Course Modules</th>
<th>Year/Semester and Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research Project</td>
<td>M-RAD</td>
<td>Research project + Special syllabus (minimum 5 ECTS)</td>
<td>Year 2/ Autumn and Spring</td>
</tr>
<tr>
<td>Module 6</td>
<td>RAD301</td>
<td>Radiation protection and waste management</td>
<td>Year 1/ Febr – May In France</td>
</tr>
<tr>
<td>Module 5</td>
<td>RAD300</td>
<td>Risk management and emergency planning</td>
<td>Year 1/ Febr – May In France</td>
</tr>
<tr>
<td>Module 4</td>
<td>KJM360</td>
<td>Assessing risk to man and environment</td>
<td>Year 1/ January</td>
</tr>
<tr>
<td>Module 3</td>
<td>MINA310</td>
<td>Project Management and Research Methods</td>
<td>Year 1/ Sept – Nov with exam in Dec</td>
</tr>
<tr>
<td>Module 2</td>
<td>KJM351</td>
<td>Radioecology - Behaviour of radionuclides in the Environment</td>
<td>Year 1/ Sept – Nov with exam in Dec</td>
</tr>
<tr>
<td>Module 1</td>
<td>KJM350</td>
<td>Radiation and radiochemistry</td>
<td>Year 1/ Aug-Sept with exam in Dec</td>
</tr>
</tbody>
</table>

Courses are held in collaboration with Institut de Radioprotection et de Sûreté Nucléaire, France att/ Dr. Cristian Tamponnet and Middlesex University, UK att/ Dr. Hemda Garelick and Dr. Huw Jones.

Supported by EU 6th FP ENEN-II project, (Contract No FP6 - 036414).
<table>
<thead>
<tr>
<th>Titles of course modules within Master in Radioecology</th>
<th>Credits</th>
<th>Where Country/Inst.</th>
<th>Course responsible</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research project + Special syllabus (minimum 5 ECTS)</td>
<td>60</td>
<td>EU countries</td>
<td></td>
</tr>
<tr>
<td>Mod. 6: Radiation protection and waste management</td>
<td>10</td>
<td>France/IRSN</td>
<td>Dr. Christian Tamponnet</td>
</tr>
<tr>
<td>Mod. 5: Risk management and emergency planning</td>
<td>10</td>
<td>France/IRSN</td>
<td>Dr. Christian Tamponnet</td>
</tr>
<tr>
<td>Mod. 4: Assessing risk to man and environment</td>
<td>10</td>
<td>Norway/UMB</td>
<td>Prof. Deborah H. Oughton</td>
</tr>
<tr>
<td>Mod. 3: Project Management and Research Methods</td>
<td>10</td>
<td>Norway/UMB</td>
<td>Ass. Prof. Lindis Skipperud</td>
</tr>
<tr>
<td>Mod. 2: Radioecology - Behaviour of radionuclides in the Environment</td>
<td>10</td>
<td>Norway/UMB</td>
<td>Prof. Brit Salbu</td>
</tr>
<tr>
<td>Mod. 1: Radiation and radiochemistry</td>
<td>10</td>
<td>Norway/UMB</td>
<td>Prof. Brit Salbu</td>
</tr>
</tbody>
</table>
Research project possibilities:

Norwegian University of Life Sciences (UMB) have close collaboration with The University Centre in Svalbard (UNIS).

There are possibilities for fieldwork at Spitsbergen, Svalbard, within the Master in Radioecology.

UNIS is the world’s northernmost higher education institution, located in Longyearbyen, Svalbard, at 78º N. UNIS offers courses at the undergraduate, graduate and Ph.D. level within Arctic Biology, Arctic Geology, Arctic Geophysics and Arctic Technology. About 350 students from all over the world take one or more courses every year at UNIS. About half of the students are Norwegian and 50 % are international students and English is the official language at UNIS. UNIS offers also unique possibilities to use the Arctic nature as a laboratory and an arena for field excursions and data collection; forming the basis of the Master research project.

The international setting and the small and intimate campus, make UNIS a unique study destination where students from all over the world get hands-on experience in Arctic studies.

Foto: Nils Petter Dale, UNIS
Course responsible

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**Cost of Living**

The following estimated costs are for a single student for one semester of 5 months. We would like to point out that this is a minimum budget.

- Accommodation NOK 12,500
- Food/household NOK 15,000
- Books NOK 4,000
- Phone NOK 2,000
- Local transport NOK 1,000
- Semester fee NOK 340

Total/semester NOK 34,840

Cost per month NOK 6,968 (~ 871 EURO/month)

**Cost in France:**

Currently, the average student budget is around 800 € per month outside the Paris area and around 1100 € per month inside Paris.

• Measuring Uranium and daughter products in a stone from a uranium mining and tailing site in Kyrgyzstan (upper left).

• The medium to low dose Co-60 gamma source at University of Life Sciences, Norway (upper, middle).

• Sampling of fish organs for radionuclide and trace metal analysis (upper, right).

• Radioactive particle from the Chernobyl accident found in Norway (left).

• Synchrotron X-ray microtomography, with computerised slicing, of a radioactive particle from Chernobyl (below, left).

• Water sampling and “in situ” water fractionation (below, middle).

• Kurday Uranium mining site in Kazakhstan (below, right).