



## Training Course on Biological Effects of Radiation and Radiation Protection

**Place**  
Munich, Germany

**Date**  
July 30 - 31, 2009

### Who should attend?

The course module is tailored to university graduates in engineering and science preparing for careers at nuclear utilities, vendors, suppliers, regulators, international organisations, expert organisations and consultants. The module is also well suited for young academic professionals in nuclear organisations and for nuclear re-education of engineers and scientists working in other fields.

### Lecturers

The lectures are given by internationally renowned experts and executives from industry, research institutes and universities.

### Registration deadlines

Early registration: June 26<sup>th</sup>, 2009

Late registration: July 27<sup>th</sup>, 2009

### Registration fees\*

Early registration: 1.000 €

Late registration: 1.200 €

\* Fees include VAT, cover lectures and course material.

ENEN members receive a 20% reduction.

Grants are available for a limited number of students.

### Information / registration

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Further details and registration at [www.isar.tum.de/courses](http://www.isar.tum.de/courses)

### Venue and Accommodation

The lectures will be given on the premises of the Technical University of Munich.



# Training Courses



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### The ISaR Institute for Safety and Reliability

The ISaR Institute is a scientific organisation offering expertise and methods for assessing and optimising the safety and the reliability of nuclear power plants and other complex systems. Main fields of activity are consulting on nuclear and interdisciplinary safety issues, analytical research related to simulation and probabilistic safety assessment, and training of graduates for nuclear careers. ISaR is located at the campus of the TU München in Garching near Munich. [www.isar.tum.de](http://www.isar.tum.de)

### The INSTN

The National Institute for Nuclear Science and Technology, as a part of the CEA, is a higher education institution under the joint supervision of the Ministries in charge of Education and Industry. The INSTN's mission is to disseminate the CEA's knowledge and know-how around the world. The INSTN headquarters are located at the Saclay CEA Centre nearby Paris. [www-instn.cea.fr](http://www-instn.cea.fr)

### The ENEN Association

The European Nuclear Education Network is a non-profit international organisation whose mission is to preserve and further develop higher nuclear education and expertise. Members are universities and organisations involved in the application of nuclear science and ionising radiation with established relations to universities. At present ENEN has 51 members in 20 countries. [www.enen-assoc.org](http://www.enen-assoc.org)

### The Chair of Nuclear Engineering of TUM

The NTech Chair of the Technische Universität München belongs to the Faculty of Mechanical Engineering located at the Garching Campus. The chair is offering both a Bachelor and a Master program in nuclear engineering. Activities focus on applications of nuclear technology and safety analysis of nuclear systems. Current research points relate to best estimate safety analysis of NPPs and to neutronic and thermal-hydraulic methodologies. [www.ntech.mw.tum.de](http://www.ntech.mw.tum.de)



## Summary

This course module provides an overview on the main concepts of radiation protection and their implementation by standards and practical measures. The focus is put on a balanced presentation of current knowledge about biological effects of radiation, fundamental international protection requirements, measurement techniques, and present day protection practice in nuclear facilities.

## Objectives

### Participants should achieve a good understanding of

- the types of radiation and their biological effects
- the current knowledge about low level radiation effects and their epidemiological bases
- international requirements for radiation protection
- techniques for radiation measurements and dosimetry
- available methods to reduce and limit exposures
- specifics of radiation protection in nuclear power plants

### Participants should acquire a basic orientation about

- relevant national and international institutions
- selected national radiation protection standards

## Syllabus

- Biological effects of radiation
  - different types of radioactive radiation
  - interactions of radiation with matter
  - biological impact of radiation
  - biological effectiveness
  - low level radiation effects and epidemiology
  - overview of studies on health risk to the public through nuclear installations
- Radiation measurements and protection concepts
  - radiation measurements with lab sessions
  - dosimetry
  - radiation shielding
  - protection against external irradiation
  - protection against contamination
- Regulatory framework of radiation protection
  - overview of national and international institutions
  - ICRP working methods and reports
  - Euratom basic safety standards and other directives
  - selected national standards
- Radiation protection in nuclear power plants

