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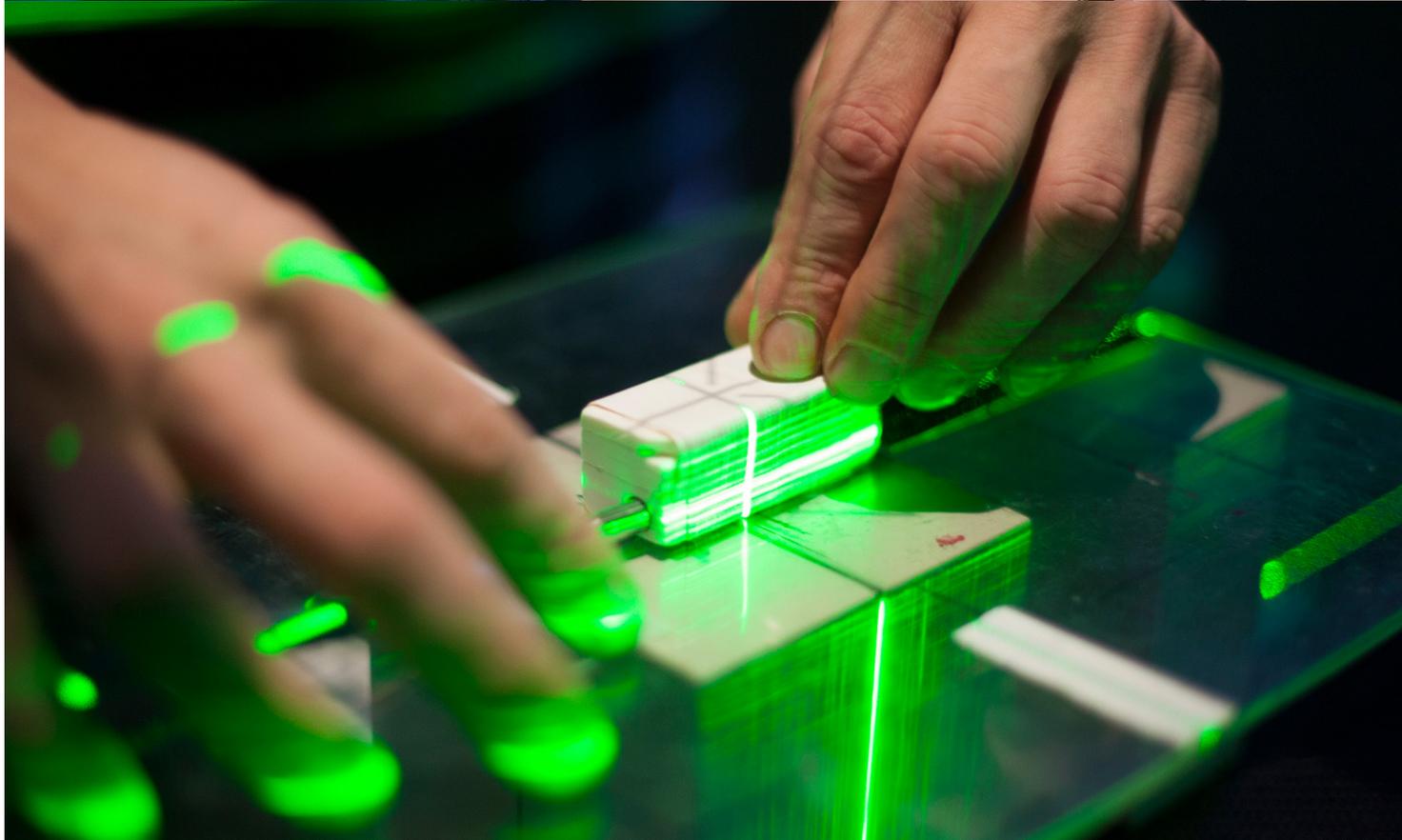
**IRSN** [ACADEMY

INSTITUT DE RADIOPROTECTION  
ET DE SÛRETÉ NUCLÉAIRE



# IRSN ACADEMY TRAINING CATALOGUE 2022

Experts for experts



MEMBER OF

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# FOREWORD

Dear Experts,

The IRSN Academy catalogue already covers a broad range of training themes on emergency preparedness, nuclear safety & security, and radiation, waste and transport safety.

IRSN Academy offers continuous training to ensure that staff of the Nuclear Regulatory Authority and Technical Safety Organizations or any professionals involved in licensing procedures are able to maintain the level of skills and knowledge required for the current positions, and that they have the opportunity to prepare in time to take on new tasks or promotions.

Our training and tutoring programs are delivered exclusively by senior professionals from the Institute of Radioprotection and Nuclear Safety (IRSN), the French TSO who takes the latest technical developments into consideration. This guarantees you lasting improvement in your practices.

Hoping to meet you soon in our training sessions, we are at your disposal to guide you in your choices and work with you to develop tailor-made training or adapt existing training courses.

Frédérique BOULESTEIX  
Head of IRSN Academy.

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## Your Contact at IRSN Academy

**Ludivine PASCUCCI CAHEN**

International Training and Tutoring Manager

+ 33 (0) 1 58 35 92 48

By email:

[training-tutoring@irsn.fr](mailto:training-tutoring@irsn.fr)

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# IRSN Academy Presentation

**IRSN has its own training organization: IRSN Academy, which offers professional training and tutoring in fields like Radiation Protection, Nuclear Safety, Nuclear Safeguards & Security, Emergency Preparedness and Response. Its mission is to share the knowledge and expertise of the French nuclear safety organizations. This training center was set up to meet the growing need for trained experts. IRSN Academy has also partnerships with the major European technical safety organizations (which are also members of the ETSON network) to pool their resources for designing training courses.**

## Partners

The European Commission through its Instrument for Nuclear Safety Cooperation Training and Tutoring (INSC T&T), the IAEA Technical Cooperation Program, and the IAEA Nuclear Safety and Security Department (among other programs and resources), rely on IRSN Academy to provide their beneficiary organizations and countries with training and tutoring in nuclear safety/security and radiation protection.

## The Pedagogical Team

The team consists of a body of senior experts from IRSN. Their goal is to promote harmonization of technical practices in the fields of nuclear safety, nuclear security, and radiation protection, and to develop a network of regional and international experts.

IRSN Academy is managed by a permanent team in charge of training course planning and design and administrative, logistical, and prospective management.

## Catalogue

The 2022 curriculum comprises 19 courses.

These are organized in multiple sessions that take place in Europe and elsewhere.

## Our Training

IRSN Academy offers courses in both intercompany and customized intracompany training. To best meet your needs, we can work with you to develop tailor-made training or adapt existing training courses.

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# Intracompany and Custom Solutions

**IRSN Academy, your custom training partner to help you meet the needs of your teams.**

In addition to the sessions listed in the IRSN Academy Training Catalogue, we are at your disposal to:

- address your strategic and professional goals;
- assess your needs and draw up a set of specifications;
- work with your teams to develop a training content to your satisfaction.

The custom training sessions are set up either on your premises, at IRSN Academy, or in another place of your choosing.

The advantages of intracompany training:

## Customization

The training procedures that are set up are geared not only to your employee needs, but also to your company and to the focus of your project. By learning more about your corporate culture, we can also adapt your own tools in order to design appropriate practical exercises and scenarios.

## Flexibility

The duration of the training, the time frame and the instructor profiles are arranged to suit you, and your groups are formed as a function of employee profile.

## Teaching Approach

IRSN Academy training courses are designed based on active and participative methods, with a mix of theory and hands-on experience to foster and optimize the transfer of expertise and the sharing of knowledge.

## Training Cost

Your entire team is trained together and at lower cost.

## Tried-and-True Support Methods

The Intra training manager takes all of your issues into consideration when managing the training projects:

- > **Before:** preliminary meeting or interview, recommendations (formats, contents, duration and tools), needs definition support, diagnostic assessment;
- > **During:** training on your tools, teaching innovations, custom support, dedicated team;
- > **After:** immediate and delayed assessment, debriefing, action plan and training program.

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## Examples of Customized Intra Training Projects

Explore IRSN Academy's customized training solutions through examples of projects that we have designed and carried out for our customers in different fields of expertise, for either a TSO or a company. A dedicated IRSN Academy team works with you and for you, from the time you make your request through to the actual setup, to develop a training procedure that is adapted to your needs, and which takes your constraints into consideration.

### **Nuclear Safety**

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Course Title: Training Programs for Future CRISTAL Users

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Customer: CEA, IRSN, ORANO, EDF

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Duration: 4-5 days

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Description: The CRISTAL calculation tool for the field of nuclear criticality safety has a data library and a new-generation user interface (LATEC). It is designed for safety studies, in particular in the case of requirements like MOX fuel, high burn-up fuel, etc.

### **Nuclear Security**

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Course Title: EXTREME

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Customer: IAEA Department of Nuclear Safety & Security

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Duration: 3 days

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Description: Exercises are designed to make essential skills and knowledge available to the NPP staff, thereby ensuring an effective response to an emergency.

### **Radiation Protection**

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Course Title: Radiation Protection in the Workplace

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Customer: NOVARKA Ukraine (Consortium VINCI & Bouygues)

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Duration: 4 days

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Description: Training course (in English, French and Russian) for workers who are potentially exposed to ionizing radiation in their professional environment.

### **Emergency Preparedness and Response**

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Course Title: Emergency response to transport accidents involving radioactive material at sea and in port zone.

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Customer: Singapore Nuclear Research and Safety Initiative (SNRSI)

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Duration: 5 days

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Description: Specific training intended for port authorities, homefront and emergency response agencies and radiation protection regulatory body so that they are able to develop their emergency response plans to deal with incidents and accidents such as fire, leakage, breach in packaging, containers dropping into the sea.

## Contact us

For support for your intracompany training projects, you can contact:

**Ludivine PASCUCCI CAHEN** (training manager)

+ 33 (0) 1 58 35 92 48

By email: [training-tutoring@irsn.fr](mailto:training-tutoring@irsn.fr)

# Emergency Preparedness and Response

The training on Emergency Preparedness and Response (EPR) in case of a nuclear or radiological accident situation deals with the radiation hazards associated with such a situation and how to be prepared to respond appropriately. It addresses international and European requirements; the effects of ionizing radiation; the exposure pathways; the strategy to manage population protection during the emergency and post-accidental phases; and the corresponding needs for planning, tools, equipment, and training.

EPR is illustrated using emergency situations arising, for example, in a nuclear power plant, during the transport of nuclear fuel, or with a damaged source.

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## Our training offer

- > **C01028 - National System for Emergency Preparedness and Response**
- > **C01052 - Emergency Response to Transport Accidents involving Radioactive Materials at Sea and in Port Zones**



# National System for Emergency Preparedness and Response

**Session:** Consult on-line training schedule

**Registration deadline:** 3 months prior to course

**Duration:** 5 days  
Certificate of attendance will be issued to participants who attend the full course.

**Price:** See website

**Code:** CO1028

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**Contact**  
<mailto:training-tutoring@irsn.fr>

**Online catalogue**  
<https://irsn-academy.com/en/training-programs/>

**Examination:**  
Knowledge testing (multiple choice exam) will be performed on the full course content and successful candidates will be issued with a Knowledge Certificate.

**Teaching methods:**  
Lectures, discussions and practical sessions are included.  
Working group exercises and technical visits are supervised by experienced TSO experts.

A USB stick containing the course material will be provided.

## OBJECTIVES

Helping people and organisations responsible for national emergency response to be ready to manage unexpected situations arising from nuclear or radiation related accidents so as to provide government with the best possible technical support and assistance for managing the crisis.

## TARGET AUDIENCE

This training is intended for professionals from nuclear regulatory authorities and technical support organisations with responsibilities associated with the implementation of emergency preparedness at a national level.

## PREREQUISITES

Participants should have a basic knowledge of accidents in nuclear facilities and in the field of applied radiation technologies.

## LEARNING OUTCOMES

- A better understanding of the general principles of EP&R: basic goals & general requirements, implementation.
- A view of regulations in force in various European countries and differences between these countries.
- A better understanding of emergency response arrangements in different European countries: goals, emergency response phases, emergency management, roles & responsibilities, assessment methods & tools, on-site and off-site plans.
- A perspective of the importance of communication during a nuclear crisis and of acquiring its basic principles.
- A knowledge of resources needed for an emergency center to function.
- A practical understanding of emergency preparedness exercises.
- A better understanding of the role of mobile teams in emergency situations.

## PROGRAM

The 5-day training module will cover the following subjects:

- Introduction to EP&R definitions and generalities, with presentation of related regulations in European countries.
- Emergency response arrangements in Europe in case of accident, including communication and information dissemination in emergency situations.
- The emergency centers of nuclear safety authorities and TSOs, including organization, methods & tools, information exchanges and emergency preparedness.
- Post-accident management and operational management.
- Technical visit with feedback from a radiotherapy accident.

At the end of the module, a roundtable discussion session addresses issues identified by participants. It is followed by an evaluation during which participants give their impressions of the module, with a review of the degree to which the needs expressed on the first day of training were met.



# Emergency Response to Transport Accidents involving Radioactive Materials at Sea and in Port Zones

**Session:** consult on-line training schedule

**Registration deadline:** 3 months prior to course

**Duration:** 5 days

Certificate of attendance will be issued to participants who attend the full course.

**Price:** Specialized training course. Please contact us.

**Code:** CO1052

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## Contact

<mailto:training-tutoring@irsn.fr>

## Online catalogue

<https://irsn-academy.com/en/training-programs/>

## Examination:

Knowledge testing will be based on the emergency organization set up by participants on the last day of the training course. Successful candidates will be issued with a Knowledge Certificate.

## Teaching methods:

Lectures, discussions and practical sessions are included.

Working group exercises and technical visits are supervised by experienced TSO experts.

A USB stick containing the course material will be provided.



## OBJECTIVES

Strengthening and enhancing professional knowledge and skills on emergency preparedness and response relating to the maritime transport of radioactive material.

## TARGET AUDIENCE

This training is intended for:

- Port authorities,
- The radiation protection regulatory body.

## PREREQUISITES

Participants should have a basic knowledge of incidents and accidents involving fire, leakage, breach in packaging, containers dropping into the sea, etc.

## LEARNING OUTCOMES

- A better understanding of the international regulations on the safe transport of radioactive materials and on safeguarding the transport of nuclear materials, with a focus on maritime specificities.
- A better understanding of the principles of international regulations for emergency organizations in case of a transport accident involving radioactive material.
- A better understanding of the different threats and difficulties related to maritime accidents involving radioactive material.
- A better understanding of actual methods to deal with such accidents.

## PROGRAM

The 5-day training module alternates lectures and exercises on practical test-cases (table-top exercises on real accident situations). The training is divided into 13 lectures and 6 working group sessions.

### Lectures

The lectures cover a wide range of aspects of the organization of emergency operations in case of a transport accident involving radioactive material. The aim of the course is to give a thorough understanding of international regulations and guidance (such as IAEA GSR Part 7, SSR-6, NSS-13, NSS-9 and TS-G-1.2, as well as IMO IMDG, INF and SOLAS). The French approach is also presented as an actual example. Students will be presented with cases based on potential or actual accidents. The following items are covered:

- review of potential hazards induced by radioactive materials.
- international regulations for the safe transport of radioactive materials.
- international regulations for the security of transport of nuclear materials.
- maritime transport of radioactive materials.
- emergency preparedness and response:
  - international regulations and guidance,
  - actual practice, experience and feedback,
  - developing an organization.

### Working groups

Specific accident cases were developed for the trainees to test their knowledge and skills. These will be presented mostly during the last three days of the training course.

The trainees will perform the assessments by themselves with guidance from the trainers where necessary. The course is designed for ~20 participants, divided into two or three groups of 7-10 people as a function of how individual cases are addressed. Roles will be played (e.g. authority, consignor, technical support).

At the end of the module, a roundtable discussion session addresses issues identified by participants. It is followed by an evaluation during which participants give their impressions of the module, with a review of the degree to which the needs expressed on the first day of training were met.

# Nuclear Safety

The safety of nuclear facilities can be more effectively assessed when there is a full understanding of the physical and chemical phenomena at work during their operation. A wide range of activities contributes to the safety of existing nuclear facilities and future ones, including: drafting or reviewing safety files for facilities in operation or under construction; providing support to safety-authority inspection teams; helping to update national and international regulations; and developing research programs on accident prevention and on managing the consequences of major accidents.

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## Our training offer

- > **CO1012 - Decommissioning Safety**
- > **CO1019 - Regulatory Control of Nuclear Sites: Inspection of I&C and Electrical Systems**
- > **CO1020 - ASTEC: Accident Source Term Evaluation Code**
- > **CO1023 - Simulating Reactor Functioning during Incident and Accident - SOFIA**
- > **CO1032 - Lessons Learned from the Fukushima Daiichi Accident and the EU Stress Test**
- > **CO1040 - Regulatory Control of Nuclear Sites: Inspection during the Construction Phase - Site Evaluation (Module 2)**
- > **CO1043 - Safety Aspects and Regulatory Requirements Related to Fusion Reactors in France**
- > **CO1055 - CRISTAL - Tools for Criticality Safety Calculation**

# Decommissioning Safety

**Session:** Consult on-line training schedule

**Registration deadline:** 3 months prior to course

**Duration:** 5 days  
Certificate of attendance will be issued to participants who attend the full course.

**Price:** See website

**Code:** CO1012

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## Contact

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## Online catalogue

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## Examination:

Knowledge testing (multiple choice exam) will be performed on the full course content and successful candidates will be issued with a Knowledge Certificate.

## Teaching methods:

Lectures, discussions and practical sessions are included.  
Working group exercises and technical visits are supervised by experienced TSO experts.

A USB stick containing the course material will be provided.

## OBJECTIVES

To address topics relevant to the decommissioning of nuclear facilities. The training will consider aspects of national and international regulations, practical experiences and working-group activities related to the conduct of regulatory review.

## TARGET AUDIENCE

This training is intended mainly for professionals from nuclear regulatory authorities and technical safety organizations.

## PREREQUISITES

Participants should have work experience and be familiar with fundamentals on different types of nuclear facilities.

## LEARNING OUTCOMES

Participants will acquire:

- The fundamentals of decommissioning of nuclear facilities, including, inter alia, aspects of planning, conduct and termination of decommissioning.
- Detailed knowledge on the decommissioning of different types of nuclear facilities and on start points for decommissioning phases.
- Feedback on licensing and supervision experience during decommissioning.
- An introduction to an internationally accepted methodology for conducting decommissioning safety assessments.
- An introduction to an internationally accepted methodology for the regulatory review of decommissioning safety assessment results.
- Information on safety assessment and related reviews from national examples.
- An understanding of how safety assessment results are implemented during decommissioning operations.

## PROGRAM

The training will start with an overview of decommissioning aspects and the presentation of ongoing decommissioning projects (NPPs and fuel cycle facilities). This will ensure that all participants share the same understanding of decommissioning, and will set the scene for the further lectures.

A presentation of the methodologies used in France to make safety assessments and conduct regulatory reviews of such assessments will be the starting point for lectures by specialists on the following subjects: risk identification; human factors; radiation protection; fire safety; risks linked to handling activities during decommissioning; and radiological characterization vs. waste management.

A test case in radiation protection during decommissioning will be proposed to illustrate how to deal with these issues, and a specific session will be dedicated to innovative techniques for decommissioning, featuring 3D simulation and contaminated site characterization with geostatistical concepts.

At the end of the module, a roundtable discussion session addresses issues identified by participants. It is followed by an evaluation during which participants give their impressions of the module, with a review of the degree to which the needs expressed on the first day of training were met.



# Regulatory Control of Nuclear Sites: Inspection of I&C and Electrical Systems

**Session:** Consult on-line training schedule

**Registration deadline:** 3 months prior to course

**Duration:** 5 days  
Certificate of attendance will be issued to participants who attend the full course.

**Price:** See website

**Code:** CO1019

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**Examination:**  
Knowledge testing (multiple choice exam) will be performed on the full course content and successful candidates will be issued with a Knowledge Certificate.

**Teaching methods:**  
Lectures, discussions and practical sessions are included.  
Working group exercises and technical visits are supervised by experienced TSO experts.

A USB stick containing the course material will be provided.

## OBJECTIVES

To provide trainees with an understanding of the regulatory control processes related to reactor instrumentation, plant control and electrical systems.

## TARGET AUDIENCE

This training is intended for:

- Engineers wishing to acquire general knowledge of I&C and Electrical Systems technology and operation, and their role in the safety of nuclear facilities in normal and accident conditions.
- Professionals from regulatory authorities and technical support organizations.
- Members of reactor operator/licensee professional staff.

## PREREQUISITES

Participants are expected to have basic knowledge in the area of nuclear and radiation science and technologies.

## LEARNING OUTCOMES

Participants will acquire:

- The fundamentals of instrumentation and control systems.
- The fundamentals of electrical systems.
- Insight into the differences between analogue and digital I&C systems and individual pros and cons for different applications.
- The ability to apply their knowledge and skills to the main digital components, both the ones currently used and those considered for use in future nuclear plants.
- A grasp of design and regulatory requirements.
- Knowledge about the state of the art on human-machine interfacing and computerized control rooms.
- A grasp of the competencies on main components and issues related to the electrical systems and networks in a plant.
- A grasp of the regulatory procedures needed to ensure a good level of compliance with safety requirements.

## PROGRAM

In addition to the general introduction, the 5-day training module will cover the following subjects:

- The basis for inspection and its role in the overall licensing process.
- The importance of reactor electrical systems and instrumentation/control systems in safety.
- Design, conduct, reporting and follow-up of inspection programs for SSCs during design, manufacture, construction, testing, commissioning and operation.

At the end of the module, a roundtable discussion session addresses issues identified by participants. It is followed by an evaluation during which participants give their impressions of the module, with a review of the degree to which the needs expressed on the first day of training were met.



# ASTEC: Accident Source Term Evaluation Code

**Session:** Consult on-line training schedule

**Registration deadline:** 3 months prior to course

**Duration:** 5 days  
Certificate of attendance will be issued to participants who attend the full course.

**Price:** See website

**Code:** CO1020

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**Examination:**  
Knowledge testing (multiple choice exam) will be performed on the full course content and successful candidates will be issued with a Knowledge Certificate.

**Teaching methods:**  
Lectures, discussions and practical sessions are included.  
Working group exercises are supervised by experienced TSO experts belonging to the IRSN ASTEC team.

A USB stick containing the course material will be provided.

## OBJECTIVES

To provide a basic understanding of the ASTEC software capabilities and its application in reactor accident source term assessment and severe accident management. It should be noted that participants cannot be expected to acquire an in-depth theoretical knowledge of severe accident phenomena from the brief description of ASTEC physical modeling principles presented in this course.

## TARGET AUDIENCE

The training course is intended for the benefit of professional engineers and scientists with university-level degrees involved in NPP safety analysis related especially to severe accidents.

## PREREQUISITES

Participants will require knowledge of severe accident phenomenology and an experience in running computer codes.

## LEARNING OUTCOMES

Participants will acquire:

- An understanding of ASTEC software capabilities.
- Sufficient understanding of the software use to perform first calculations for the purpose of interpreting severe accident experiments and developing NPP accident scenarios.

## PROGRAM

The Accident Source Term Evaluation Code (ASTEC) has been developed over a number of years for the simulation of severe accident sequences in water-cooled nuclear power plants. The software simulates all severe accident phenomena, except steam explosion and loss-of-containment mechanical integrity, from the initiating event up to the possible release of radioactive products ("source term") from the containment.

The main ASTEC applications include nuclear reactor safety analysis source term evaluations, and development of severe accident management guidelines.

The current V2 version is applicable to water-cooled reactors including PWR, VVER and BWR and to pressurized heavy-water reactors.

The software builds on the European body of knowledge on severe accidents. It has been subjected to an intensive validation through more than 160 experiments, including separate and coupled-effect tests, integral tests (e.g. Phébus FP in-pile tests) and, in particular, OECD/NEA ISP exercises. The validation matrix is being continuously expanded based on the results of ongoing international programs (PEARL, STEM2-OECD, CCI-OECD, ThAI-OECD, etc.).

Following a general presentation of the software structure and user tools, the lectures focus on various modules used to simulate severe accident phenomena, each one addressing either NPP zones during the whole scenario or specific parts of the scenarios.

At the end of the module, a roundtable discussion session addresses issues identified by participants. It is followed by an evaluation during which participants give their impressions of the module, with a review of the degree to which the needs expressed on the first day of training were met.

# Simulating Reactor Functioning during Incident and Accident - SOFIA

**Session:** Consult on-line training schedule

**Registration deadline:** 3 months prior to course

**Duration:** 5 days

Certificate of attendance will be issued to participants who attend the full course.

**Price:** See website

The maximum number of students is limited to eight participants.

**Code:** CO1023

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## Contact

<mailto:training-tutoring@irsn.fr>

## Online catalogue

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## Examination:

Knowledge testing (multiple choice exam) will be performed on the full course content and successful candidates will be issued with a Knowledge Certificate.

## Teaching methods:

Lectures, discussions and practical sessions are included.

Working group exercises and technical visits are supervised by experienced TSO experts.

A USB stick containing the course material will be provided.

## OBJECTIVES

To acquire a working knowledge of the SOFIA simulator for observation of functioning under incident and accident conditions.

## TARGET AUDIENCE

This training is intended for engineers who wish to acquire general knowledge in functioning physics and safety of pressurized water reactors (PWR) under normal and accident conditions.

## PREREQUISITES

Participants should have some basic knowledge of PWRs.

## LEARNING OUTCOMES

Participants will acquire:

- A better understanding of the physical phenomena that occur in a PWR during normal operation, especially during the startup stage and under accident conditions.
- A global view of the main systems of the nuclear island used in normal and accident conditions, and of how they interact.
- An understanding of the main steps in normal operational procedures as the function of the main automatic controls of the plant unit, for different states of the plant (from cold shutdown state for maintenance to full power operation).
- An understanding of the main operational safety procedures under accident conditions (LOCA, SGTR).
- The ability to assess situations that can lead to severe accidents, such as loss of cooling water, loss of steam generator feedwater supply, or loss of power; demonstration through simulation of the Three Miles Island (TMI) and Fukushima accidents.

## PROGRAM

The course focuses on lectures and practical work sessions on the SOFIA simulator.

To perform analysis of thermal hydraulics during a reactor accident or safety assessment, the French technical safety organization IRSN uses the CATHARE (Code for Analysis of Thermal Hydraulics during an Accident of Reactor and Safety Evaluation) system code for PWR safety analysis, accident management and definition of plant operating procedures, and for research and development.

The module will cover the following subjects:

- PWR systems and normal reactor operation:
  - Introduction to PWR operation.
  - Main PWR systems.
  - General information and sequence leading to the hot shutdown state.
  - Description of the CATHARE thermal-hydraulic code.
  - Basics of core physics, divergence and core control.
  - Divergence and power increase turbine coupling.
- Design basis accidents for PWR:
  - Description of loss-of-coolant accidents (LOCA).
  - Large-break LOCA transient (LB LOCA).
  - Small-break LOCA transient (SB LOCA), fourth sequence: failure of first actions.
  - Description of steam generator tube rupture (SGTR accidents).
  - SGTR transient.
  - Sixth sequence: intervention strategy.
  - Seventh sequence: decision-making process for assault.
- Other PWR accidents:
  - TMI and Fukushima accidents.



# Lessons Learned from the Fukushima Daiichi Accident and the EU Stress Test

**Session:** Consult on-line training schedule

**Registration deadline:** 3 months prior to course

**Duration:** 5 days  
Certificate of attendance will be issued to participants who attend the full course.

**Price:** See website

**Code:** CO1032

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**Examination:**  
Knowledge testing (multiple choice exam) will be performed on the full course content and successful candidates will be issued with a Knowledge Certificate.

**Teaching methods:**  
Lectures, round table with experienced experts from European safety organizations.  
Practical exercises will take place during the week.

A USB stick containing the course material will be provided.

## OBJECTIVES

To provide trainees with a thorough background on the accident at the Fukushima Daiichi nuclear power plant, its consequences and all related topics; on the lessons learned from the plant behavior assessment, the severe-accident management and emergency response; and on the insights from post-Fukushima activities like the EU stress tests.

## TARGET AUDIENCE

Professionals involved in nuclear safety and radiation protection activities, and who are employed by nuclear regulators or their technical safety organizations.

## PREREQUISITES

Basic knowledge in the area of nuclear and radiation science and technologies.

## LEARNING OUTCOMES

Trainees will gain important up-to-date information to apply to their activities in the fields of nuclear safety and radiation protection.

## PROGRAM

The 5-day training module will cover the following subjects:

- General presentations of the accident, its management and consequences.
- Extreme natural hazards.
- Safety systems of the Fukushima Daiichi plant and accident management.
- European stress tests.
- Examples of national approaches in Europe.
- Off-site emergency response and consequences of the Fukushima Daiichi accident – short-term response and long-term management.
- Challenges related to emergency preparedness and post-accident management.
- Facility types other than NPP, and R & D related to the Fukushima accident.

At the end of the module, a roundtable discussion session addresses issues identified by participants. It is followed by an evaluation during which participants give their impressions of the module, with a review of the degree to which the needs expressed on the first day of training were met.



# Regulatory Control of Nuclear Sites: Inspection during the Construction Phase – Site Evaluation (Module 2)

**Session:** Consult on-line training schedule

**Registration deadline:** 3 months prior to course

**Duration:** 5 days  
Certificate of attendance will be issued to participants who attend the full course.

**Price:** See website

**Code:** CO1040

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**Examination:**  
Knowledge testing (multiple choice exam) will be performed on the full course content and successful candidates will be issued with a Knowledge Certificate.

**Teaching methods:**  
Lectures, discussions and practical sessions are included.  
Working group exercises and technical visits are supervised by experienced TSO experts.

A USB stick containing the course material will be provided.



## OBJECTIVES

To provide trainees with an understanding of site characteristics that are important to safety, along with the approaches for investigating their characteristics and assessing their significance.

## TARGET AUDIENCE

This training is intended for:

- Professionals involved in regulatory and technical support processes related to the investigation of nuclear facility sites and assessment of their suitability.
- Specialists entering into site assessment projects.
- Senior regulatory staff with project responsibilities for safety assessment and demonstration where site assessment plays a significant role.

## PREREQUISITES

Participants will require a basic knowledge of nuclear facility technology, nuclear and radiation safety, and nuclear regulatory processes.

## LEARNING OUTCOMES

Participants will acquire knowledge and an understanding of how regulatory processes work in practice for site investigation and assessment in the siting, design and construction phases of nuclear facility development.

## PROGRAM

The module intends to provide a practical understanding of the safety principles presented in Module 1 "Inspection during the Site Characterization and Construction Phases". It addresses the technical assessment of site characteristics and how these are linked to the safety-assessment and safety-demonstration processes. Using a very hands-on approach, it focuses on the assessment of the effects of external events occurring around the site, and the characteristics of the site and surrounding environment that could influence the transfer of radioactive material releases to people and the environment.

The module will present five days of practical exercises and case studies related to the assessment of external hazards and of environmental impacts:

- Each practical-exercise session will briefly present the regulatory framework for the corresponding topic.
- Each group will present its results for general discussion.
- Two sessions will introduce the use of specific technical assessment tools: Renext for the estimation of extreme values of meteorological and hydrogeological hazards, and Erica for the assessment of environmental impact.
- Each case-study session will be introduced with the regulatory framework and illustrate how safety regulatory principles are implemented in the field when selecting and assessing site suitability for the nuclear facility.
- An interactive session will focus on issues related to the country of participants.

At the end of the module, a roundtable discussion session addresses issues identified by participants. It is followed by an evaluation during which participants give their impressions of the module, with a review of the degree to which the needs expressed on the first day of training were met.

**Note:** The two modules (Module 1 "Regulatory Control of Nuclear Sites: Inspection during the Site Characterization and Construction Phases" and Module 2 "Regulatory Control of Nuclear Sites: Inspection during the Construction Phase-Site Assessment") are stand-alone and participants can attend both or either modules.



# Safety Aspects and Regulatory Requirements Related to Fusion Reactors in France

**Session:** Consult on-line training schedule

**Registration deadline:** 3 months prior to course

**Duration:** 2 days

Certificate of attendance will be issued to participants who attend the full course.

**Price:** Specialized training course. Please contact us.

**Code:** CO1043

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**Contact**

<mailto:training-tutoring@irsn.fr>

**Online catalogue**

<https://irsn-academy.com/en/training-programs/>

**Examination:**

Knowledge testing (multiple choice exam) will be performed on the full course content and successful candidates will be issued with a Knowledge Certificate.

**Teaching methods:**

Lectures, discussions and practical sessions are included. Working group exercises and technical visits are supervised by experienced TSO experts.

A USB stick containing the course material will be provided.

**OBJECTIVES**

To provide participants with an overview of nuclear safety principles, regulatory requirements and the licensing process applied in France for nuclear facilities during the different phases of their life cycle, with a focus on the design and construction phases and associated quality requirements.

**TARGET AUDIENCE**

This training is intended for project leaders and professionals involved in:

- ITER design and construction
- Quality assurance
- Structures procurement
- Systems and components (SSCs) related to safety
- The licensing process and regulatory issues

**PREREQUISITES**

Participants should have a master degree in physical, chemical or natural sciences.

**LEARNING OUTCOMES**

Participants will be able to:

- Describe the safety function in a fusion plant, discuss the potential risks in a Magnetic Fusion Plant, explain the confinement and safety barrier, and understand the waste-generation mechanism and mass produced.
- Understand the safety organization in France, the purpose and fundamental principles of nuclear safety and the concept of safety culture.
- Learn more about French safety and regulatory requirements and the associated binding and enforcement provisions.
- Take cognizance of the importance of the quality management system; of the need to apply the specified quality rules for each SSC in accordance with its safety classification; and of the equal need to apply the same specified quality provisions to SSC subcontractors and ensure their compliance during the design, fabrication/construction, testing and inspection processes.

**PROGRAM**

The course focuses on the nuclear safety principles, regulatory requirements and licensing process applied in France for nuclear facilities during the different phases of their life cycle.

The 5-day training module will cover the following subjects:

- Presentation of the training course and the expected results.
- The principles and objectives of nuclear reactor safety.
- French nuclear safety regulations.
- The organization of nuclear safety in France, with presentation of the main stakeholders (including emergency preparedness and response).
- The licensing process during the different phases of a nuclear facility's life cycle.
- ITER safety expertise: methods and results.
- Quality management system for facilities and operations, with practical examples on issues related to its implementation.
- The meaning of safety culture for operators and their subcontractors.

At the end of the module, a roundtable discussion session addresses issues identified by participants. It is followed by an evaluation during which participants give their impressions of the module, with a review of the degree to which the needs expressed on the first day of training were met.

# CRISTAL - Tools for Criticality Safety Calculation

**Session:** Consult on-line training schedule

Intra-company training session is available on demand.

**Registration deadline:** 3 months prior to course

**Duration:** 5 days

Certificate of attendance will be issued to participants who attend the full course.

**Price:** See website

The maximum number of students is limited to twelve participants.

**Code:** CO1055

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## Contact

<mailto:training-tutoring@irsn.fr>

## Online catalogue

<https://irsn-academy.com/en/training-programs/>

## Examination:

Knowledge testing (multiple choice exam) will be performed on the full course content and successful candidates will be issued with a Knowledge Certificate.

## Teaching methods:

Lectures, discussions and practical sessions are included.

Practical exercises and software practice on real cases will take place during the week.

A USB stick containing the course material will be provided.

## OBJECTIVES

The main objective of the training is to use the CRISTAL V2 package for criticality calculations with LATEC graphical front-end and simulation back-end with CRISTAL codes (APOLLO2, MORET 5 et TRIPOLI-4®). Underlying numerical recipes of simulation and their limitations in the criticality-safety assessment framework are described. This training is designed to meet the needs of nuclear criticality safety practitioners.

## TARGET AUDIENCE

A person and organization responsible for design, fabrication, maintenance or review of nuclear criticality safety for a process or transportation. These persons would be Nuclear criticality safety specialists with the responsibilities of assessment and calculation.

CRISTAL package is used to performed calculations for:

- fissile materials transportations.
- nuclear fuel cycle facilities (fuel processing, reprocessing...).
- laboratories and storage units.
- unloaded nuclear reactor core.
- decommissioning or decommissioned facilities.

## PREREQUISITES

Knowledge in neutronics and main principles on nuclear criticality safety (criticality control parameters, fissile materials, etc).

## PROGRAM

### Basics

CRISTAL V2 package – Architecture and main components – Calculation routes

### Deterministic method

APOLLO2 simulation code, recommended calculation routes, standard calculations, practical cases.

### Monte Carlo method

MORET 5 and TRIPOLI-4® simulation codes, features, practical cases.

### Modelling environment

LATEC workbench, dilution laws, basics, perform and validate criticality-safety calculations

## LEARNING OUTCOMES

After the course, participants will :

- Have a general knowledge of CRISTAL package (structure, simulations tools, libraries, etc).
- Be able to perform criticality calculations with CRISTAL V2 package, relying on state-of-the-art neutronic simulation tools (APOLLO2, TRIPOLI-4®, MORET 5) and international nuclear database.
- Understand the application range of different simulation tools and methods.

# Nuclear Safeguards & Security

An understanding of nuclear security and safeguards depends on knowledge about issues like how to physically protect nuclear facilities or shipments of nuclear material; cybersecurity at nuclear facilities; nuclear material accounting and control; and international safeguards. Covering a number of aspects, IRSN Academy courses present these different concepts and explain the existing synergies and differences.

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## Our training offer

- > **CO1008 - EXTREME – External Threat Response Management Exercise**
- > **CO1011 - Nuclear Materials Protection, Nuclear Safeguards and Interface with Nuclear Safety**
- > **CO1053 - Implementing Nuclear Safeguards in practice**

# EXTREME – External Threat Response Management Exercise

**Session:** Consult on-line training schedule

**Registration deadline:** 3 months prior to course

**Duration:** 3 days  
Certificate of attendance will be issued to participants who attend the full course.

**Price:** See website

**Code:** CO1008

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## Contact

<mailto:training-tutoring@irsn.fr>

## Online catalogue

<https://irsn-academy.com/en/training-programs/>

## Examination:

Knowledge testing will be performed on the full course content and successful candidates will be issued with a Knowledge Certificate.

## Teaching methods:

Lectures, discussions and practical sessions are included.  
Working group exercises and technical visits are supervised by experienced TSO experts.

A USB stick containing the course material will be provided.

## OBJECTIVES

Identifying and developing key issues around response effectiveness in case of a severe attack against an NPP.

## TARGET AUDIENCE

Professionals:  
• involved in nuclear safety and security,  
• from national nuclear security authorities,  
• from police forces involved in nuclear emergency planning and response.

## PREREQUISITES

Participants should have basic knowledge in the fields of nuclear energy and nuclear security.

## LEARNING OUTCOMES

To improve participants' skills and understanding in the following areas:

- decision-making process to solve a complex and highly specific situation with possibly conflicting issues.
- coordination and interfaces between all stakeholders, including information and communication issues.
- planning, preparation and training to cope with a nuclear crisis resulting from a severe attack on a nuclear facility.
- managing time and people, mainly in order to recover a safe, secure situation at the nuclear site.

## PROGRAM

The scenario-driven course is based on generic case study to address crisis decision management. The scenario considers an attack on an NPP, requiring an emergency response at national level. It provides successive failures of safety functions, requiring that timely and appropriate measures be taken to stop the aggression and restore safety and security at the site. The discussion is time-stepped and facilitated.

The 3-day training module divides the scenario into four phases and nine sequences, each addressing a homogeneous stage of the emergency situation:

- Reflex phase:
  - First sequence: the attack.
- Reflection phase:
  - Second sequence: first statement/first response.
  - Third sequence: emergency management deployment.
  - Fourth sequence: failure of first actions.
  - Fifth sequence: analysis of the situation.
  - Sixth sequence: intervention strategy.
  - Seventh sequence: decision-making process for assault.
- Response phase:
  - Eighth sequence: assault by SWAT.
- Recovery phase:
  - Ninth sequence: recovery strategy.



# Nuclear Materials Protection, Nuclear Safeguards and Interface with Nuclear Safety

**Session:** Consult on-line training schedule

**Registration deadline:** 3 months prior to course

**Duration:** 5 days  
Certificate of attendance will be issued to participants who attend the full course.

**Price:** See website

**Code:** CO1011

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**Online catalogue**  
<https://irsn-academy.com/en/training-programs/>

**Examination:**  
Knowledge testing (multiple choice exam) will be performed on the full course content and successful candidates will be issued with a Knowledge Certificate.

**Teaching methods:**  
Lectures, discussions and practical sessions are included.  
Working group exercises and technical visits are supervised by experienced TSO experts.

A USB stick containing the course material will be provided.



## OBJECTIVES

- Raising awareness and instructing in the field of nuclear security, and on how it interfaces with nuclear safety and the safeguards for nuclear and other radioactive materials.
- Maintaining/increasing technical skills and ensuring sustainable development of nuclear technology.

## TARGET AUDIENCE

Professionals involved in nuclear security activities employed in National Regulatory Authorities (NRA) and Technical Support Organizations (TSO).

## PREREQUISITES

Participants should have basic knowledge in the fields of nuclear energy and nuclear security.

## LEARNING OUTCOMES

Improved understanding and skills in relation to nuclear security and its interfaces with nuclear safety and safeguards.

## PROGRAM

The course focuses on international safeguards, the physical protection of nuclear materials, and accounting for and controlling nuclear materials.

The 5-day training module will cover the following subjects:

- Nuclear security culture, the compatibility between nuclear safety and nuclear security, and the complementarities between security and safeguards.
- The approach to dealing with non-proliferation issues through international safeguards (IAEA and EURATOM).
- Nuclear security principles.
- Security of nuclear materials and nuclear facilities.
- The transport of nuclear materials.
- Accounting for and controlling nuclear materials (in connection with nuclear security).
- Measurement of nuclear materials for protection against theft.
- Security of radioactive materials.
- The assessment process for nuclear security systems.
- Emergency situations related to nuclear security.

At the end of the module, a roundtable discussion session addresses issues identified by participants. It is followed by an evaluation during which participants give their impressions of the module, with a review of the degree to which the needs expressed on the first day of training were met.



# Implementing Nuclear Safeguards in practice

**Session:** Consult on-line training schedule

**Registration deadline:** 3 months prior to course

**Duration:** 5 days  
Certificate of attendance will be issued to participants who attend the full course.

**Price:** See website

**Code:** CO1053

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**Online catalogue**  
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**Examination:**  
Knowledge testing (multiple choice exam) will be performed on the full course content and successful candidates will be issued with a Knowledge Certificate.

**Teaching methods:**  
Lectures, discussions and practical sessions are included.  
Working group exercises are supervised by experienced TSO experts.

A USB stick containing the course material will be provided.



## OBJECTIVES

Increase the knowledge of the participants:

- On the importance of implementing fully safeguards obligations to facilitate the effective and efficient application of safeguards for the country;
- On the continued evolution of safeguards through modern technology and newly developed concepts.

## TARGET AUDIENCE

Professionals involved in nuclear safeguards activities employed in National Regulatory Authorities (NRA) and Technical Support Organizations (TSO).

## PREREQUISITES

Participants should have basic knowledge in the fields of nuclear energy and nuclear safeguards.

## PROGRAM

The course focuses on implementing international safeguards in practice. The 5-day training module will cover the following subjects:

### Application of safeguards

- Non-proliferation treaty and IAEA verification;
- IAEA safeguards agreements;
- Regional control;
- Small quantity protocol (SQP);
- Additional protocol and declaration.

### Verification activities

- EURATOM inspections;
- Non Destructive Assay – gamma-ray spectrometry;
- Non Destructive Assay – neutron counting;
- Destructive assay – Containment and surveillance and monitoring;
- Hands-on demonstration of the relevant equipment.

### Case study

- Measures taken by country's Nuclear Regulatory Authorities for establishing safeguards infrastructure and providing operational support for verification activities;
- Principles of nuclear material accountancy and control.

### Safeguards & Security interface

- Information on the legal framework for nuclear security and on the categorization of nuclear material for nuclear security purposes;
- Principal differences and possible synergies between nuclear safeguards and nuclear security.

At the end of the module, a roundtable discussion session addresses issues identified by participants. It is followed by an evaluation during which participants give their impressions of the module, with a review of the degree to which the needs expressed on the first day of training were met.

# Radiation Protection

Using ionizing radiation for beneficial purposes requires appropriate protection of workers, patients, the public and the environment. Knowing and implementing safety standards for radiation protection management of radioactive waste and safe transport of radioactive waste and transport of radioactive material is of utmost importance for any stakeholder of a national regulatory system.

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## Our training offer

- > **C01018 - Application of International Regulations in Qualification and Approval of Packages for the Transport of Radioactive Materials**
- > **C01024 - Regulatory Control of Radiation Protection in Medical Applications**
- > **C01027 - Regulatory Control of the Safety of Spent Fuel & Radioactive Waste Management**
- > **C01039 - Regulatory Control of Nuclear Sites: Inspection of Environmental and Occupational Radiation Protection (Module 1)**
- > **C01044 - Regulatory Control of Nuclear Sites: Surveillance of Environmental Radioactivity (Module 2)**
- > **C01048 - Regulatory Review and Assessment of the Safety Case for Disposal Facilities**



# Application of International Regulations in Qualification and Approval of Packages for the Transport of Radioactive Materials

**Session:** Consult on-line training schedule

**Registration deadline:** 3 months prior to course

**Duration:** 5 days  
Certificate of attendance will be issued to participants who attend the full course.

**Price:** See website

**Code:** C01018

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**Online catalogue**  
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**Examination:**  
Knowledge testing will be performed on the full course content and successful candidates will be issued with a Knowledge Certificate.

**Teaching methods:**  
Lectures, discussions and practical sessions are included.  
Working group exercises and technical visits are supervised by experienced TSO experts.

A USB stick containing the course material will be provided.



## OBJECTIVES

The design and development of packages for the transport of radioactive materials must comply with the IAEA's strict safety requirements. With that in mind, the course presents the philosophy behind the regulations, the general context, and the major technical issues relevant to safety demonstrations.

## TARGET AUDIENCE

Professionals involved in the safety of transport of radioactive materials, such as:

- Package designers,
- Applicants for package approvals,
- Members of Nuclear Regulatory Authorities (NRAs),
- Members of Technical Safety Organisations (TSOs).

## LEARNING OUTCOMES

- A better understanding of the principles of the international regulations for the transport of radioactive materials.
- An ability to perform complete assessments of safety analysis reports (NRAs, TSOs).
- A better understanding of how to take into account every aspect of transport safety when designing packages (from concept to maintenance operations) and to demonstrate that they comply with regulations (designers, applicants, etc).

## PREREQUISITES

Participants should have basic knowledge in the fields of nuclear safety, mechanical studies, material behavior and heat transfer.

## PROGRAM

The training covers the principles of international regulations on the transport of radioactive materials; how to perform complete assessments of safety analysis reports; how to take every aspect of transport safety (from concept to maintenance operations) into account in the package design; and demonstrating compliance with the regulations.

## Lectures

Covering all aspects of the safe transport of radioactive materials, the lectures focus on a correct understanding and interpretation of international regulations (such as IAEA GSR and SSR-6). European practices are also presented as examples. Subjects include:

- international regulations and practice.
- package safety demonstrations (covering mechanical behavior, thermal behavior, containment, radiation protection, criticality safety, radiolysis/thermals).
- safe, correct use of packages.
- assuring compliance.
- emergency management.

## Working groups

A ~100-page, 11-part safety analysis report (SAR) on a concept package is used, covering every aspect of safety demonstrations (IAEA SSR-6, chapters I, III, IV, VI and VII). Each trainee receives a copy of the SAR. The objective is to perform a quick assessment (or preliminary analysis) of each of the following:

- elements important for safety and material classification (2 hrs).
- mechanical behavior (4½ hrs).
- thermal behavior (2½ hrs).
- containment (2½ hrs).
- radiation protection (1½ hrs).
- criticality safety (3 hrs).

*Participants are guided by a much simplified, yet complete version of the "IRSN Feedback Experience List for Transport Safety Assessment", a document from the French national guide for applicants (Guide ASN n°7) that addresses every issue encountered frequently in safety demonstrations.  
Divided into groups of 4 to 6 people, the trainees use their level of knowledge to perform the assessment either by themselves or guided by the trainers.*



# Regulatory Control of Radiation Protection in Medical Applications

**Session:** Consult on-line training schedule

**Registration deadline:** 3 months prior to course

**Duration:** 5 days  
Certificate of attendance will be issued to participants who attend the full course.

**Price:** See website

**Code:** CO1024

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**Online catalogue**  
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**Examination:**  
Knowledge testing (multiple choice exam) will be performed on the full course content and successful candidates will be issued with a Knowledge Certificate.

**Teaching methods:**  
Lectures, discussions and practical sessions are included.  
Working group exercises and technical visits are supervised by experienced TSO experts.

A USB stick containing the course material will be provided.

## OBJECTIVES

To improve knowledge in the activities of nuclear regulatory authorities and technical support organizations with respect to the regulatory control of radiation protection in medical applications (radiotherapy, nuclear medicine and diagnostic and interventional radiology).

## TARGET AUDIENCE

Professionals from nuclear regulatory authorities or technical support organizations involved in the licensing and inspection of medical activities or facilities utilizing sources of ionizing radiation.

## PREREQUISITES

Participants need basic knowledge of ionizing radiation physics, dosimetric quantities and radiation dose measurement.

## LEARNING OUTCOMES

- A better understanding of the nuclear regulatory framework, the international safety standards for radiation protection, and related EU legislation.
- Knowledge of the main elements of a regulatory program in radiation protection in medical applications.
- Knowledge of the types, design & application of radiation sources and equipment used in radiotherapy, nuclear medicine & diagnostic and interventional radiology.
- An ability to assess radiation protection measures and documentation in medical applications.

## PROGRAM

The 5-part course covers:

- **Part 1.** The nuclear regulatory framework.
- **Part 2.** Medical applications for ionizing radiation.
- **Part 3.** Radiation protection in medical facilities.
- **Part 4.** Elements of the regulatory program for radiation protection in medical applications.
- **Part 5.** Practical exercises and technical visits to nuclear-medicine and radiotherapy services.

At the end of the module, a roundtable discussion session addresses issues identified by participants. It is followed by an evaluation during which participants give their impressions of the module, with a review of the degree to which the needs expressed on the first day of training were met.



# Regulatory Control of the Safety of Spent Fuel & Radioactive Waste Management

**Session:** Consult on-line training schedule

**Registration deadline:** 3 months prior to course

**Duration:** 5 days  
Certificate of attendance will be issued to participants who attend the full course.

**Price:** See website

**Code:** CO1027

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**Online catalogue**  
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**Examination:**  
Knowledge testing (multiple choice exam) will be performed on the full course content and successful candidates will be issued with a Knowledge Certificate.

**Teaching methods:**  
Lectures, discussions and practical sessions are included.  
Working group exercises are supervised by experienced TSO experts.

A USB stick containing the course material will be provided.



## OBJECTIVES

To provide awareness and a transfer of knowledge on the safety related to each step of management, including storage and final disposal.

## TARGET AUDIENCE

Professionals employed by nuclear regulatory or nuclear safety technical expertise organizations, with a Master's degree or similar higher-education qualification and who are involved in radioactive-waste safety assessment activities.

## PREREQUISITES

Participants will require basic knowledge in the fields of nuclear safety and radioactive waste management.

## LEARNING OUTCOMES

Participants will acquire:

- Knowledge of international waste-management standards, including national aspects.
- An overview of pre-disposal radwaste management steps and techniques, with regard to the design of the safe final destination.
- An understanding of the main safety issues involved in near-surface and geological disposal, with practical cases in mind.
- The keys of anticipating the development of knowledge and resources required to assess hazards posed by radwaste repositories.

## PROGRAM

Spent fuel and radioactive waste management is a matter of concern in all nuclear countries. Some countries have already identified final disposal as a sustainable final solution in their national waste management strategy.

The training course covers the following topics:

- Regulatory framework in waste management, international standards, EU countries implementation.
- Pre-disposal requirements (basic steps, waste characterization, acceptance criteria, conditioning, nuclear waste packages).
- The storage of disused radioactive sources and spent fuel, along with the safety assessment aspects. Near-surface disposal (main safety issues, feedback from the French experience, comparison between interim storage and near storage, disposal facilities, natural external hazards).
- The main safety issues implicated in near-surface and geological disposal, with practical cases in mind.
- The main challenges faced in establishing constructive dialogue with the stakeholders involved in a waste disposal project.

At the end of the module, a roundtable discussion session addresses issues identified by participants. It is followed by an evaluation during which participants give their impressions of the module, with a review of the degree to which the needs expressed on the first day of training were met.



# Regulatory Control of Nuclear Sites: Inspection of Environmental and Occupational Radiation Protection (Module 1)

**Session:** Consult on-line training schedule

**Registration deadline:** 3 months prior to course

**Duration:** 5 days  
Certificate of attendance will be issued to participants who attend the full course.

**Price:** See website

**Code:** C01039

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**Online catalogue**  
<https://irsn-academy.com/en/training-programs/>

**Examination:**  
Knowledge testing (multiple choice exam) will be performed on the full course content and successful candidates will be issued with a Knowledge Certificate.

**Teaching methods:**  
Lectures, discussions and practical sessions are included.  
Working group exercises and technical visits are supervised by experienced TSO experts.

A USB stick containing the course material will be provided.

## OBJECTIVES

To provide participants with an understanding of the basis for regulatory inspection programs; of how such programs are linked to the nature of the radiation hazards associated with nuclear installations; and how to design, conduct and follow up such inspection programs for environmental and occupational radiation protection in nuclear installations.

## TARGET AUDIENCE

- Professionals, primarily from nuclear regulatory or nuclear safety technical expertise organizations, who are involved in activities related to the regulatory control or assessment of the safety of nuclear installations.
- Professional from licensee organizations with responsibilities for safety and licensing.

## PREREQUISITES

Participants will require basic knowledge in the area of nuclear and radiation science and technologies and an understanding of nuclear safety and regulatory processes.

## PROGRAM

The 5-day training module will cover the following subjects:

- An introduction to regulatory inspection.
- Regulatory inspection related to protection of the public and the environment.
- Regulatory inspection related to operational radiation protection.

It includes a number of practical exercises in which participants will work in groups to address issues related to the subject matter being presented.

Each day, there is a summary session to enable general feedback and discussion of the topics covered during the day.

At the end of the module, there will be a roundtable discussion session to address issues identified by participants, followed by an evaluation during which participants give their impressions of the module, with a review of the degree to which the needs expressed on the first day of training were met.

## LEARNING OUTCOMES

Participants will acquire an understanding of:

- Compliance assurance activities undertaken by the regulatory authority, with a focus on inspection.
- The nature of radiation hazards associated with nuclear facilities.
- The radiation protection and safety programs set up to monitor radiation exposure of workers in these facilities and of the surrounding populations.
- How to address the design, conduct, reporting and follow-up of inspection programs.



# Regulatory Control of Nuclear Sites: Surveillance of Environmental Radioactivity (Module 2)

**Session:** Consult on-line training schedule

**Registration deadline:** 3 months prior to course

**Duration:** 5 days  
Certificate of attendance will be issued to participants who attend the full course.

**Price:** See website

**Code:** CO1044

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**Contact**  
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**Online catalogue**  
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**Examination:**  
Knowledge testing (multiple choice exam) will be performed on the full course content and successful candidates will be issued with a Knowledge Certificate.

**Teaching methods:**  
Lectures, discussions and practical sessions are included.  
Working group exercises and technical visits are supervised by experienced TSO experts.

A USB stick containing the course material will be provided.

## OBJECTIVES

To help participants understand the principles that guide environmental radioactivity monitoring and to provide the foundation needed to develop environmental surveillance programs.

## TARGET AUDIENCE

- Professionals involved in nuclear safety and radiation protection activities.
- Professional employed by nuclear regulators or their technical safety organizations.

## PREREQUISITES

Participants are expected to have basic knowledge in nuclear and radiation science and technologies and to have attended a course on radioprotection.

## LEARNING OUTCOMES

Participants will acquire:

- Background information on environmental monitoring and the general principles guiding the development of monitoring programs.
- The ability to assess the adequacy of an environmental radioactivity monitoring network.

## PROGRAM

The 5-day training module will cover the following subjects:

- Environment radiological background and basis for surveillance of environmental radioactivity.
- International context, processes, and control of releases from facilities and activities that use ionizing radiation.
- Elements of physical dispersion and food-chain transfers.
- Metrology for environmental matrices.
- Environmental monitoring principles and practicalities with focus on 3H and 14C monitoring.
- Developing metrological facilities for radiological surveillance.
- NNR environmental laboratory visit, facts on natural background radiation in South Africa and establishing a background for a licensed nuclear site.
- Data treatment of monitoring results and dose assessment from routine releases and from emergency situations.

At the end of the module, a roundtable discussion session addresses issues identified by participants. It is followed by an evaluation during which participants give their impressions of the module, with a review of the degree to which the needs expressed on the first day of training were met.

# Regulatory Review and Assessment of the Safety Case for Disposal Facilities

8 years of collaboration between various European and other national TSOs and regulatory authorities in the EU SITEX projects resulted in the establishment of several tools for harmonization of the regulatory review and assessment of a safety case for disposal of radioactive waste. The review methods developed in this context form the heart of this course, providing a unique and innovative training opportunity for persons involved or who will be involved in the licensing of radioactive waste disposal from both operator and regulatory/TSO organizations.

**Session:** The course is made up of 3 modules that can be attended successively or independently.

**Registration deadline:** 1 month prior to each module

**Duration:** 5 days for each module. Certificates of attendance will be issued to participants who attend each module.

**Price:** See website

**Code:** CO1048

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**Contact**  
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**Online catalogue**  
<https://irsn-academy.com/en/training-programs/>

**Examination:** Knowledge testing (multiple choice exams) will be performed on each module of the course and successful candidates will be issued with a Knowledge Certificate.

**Teaching methods:** Lectures, discussions and practical modules are included. Working group exercises and technical visits are supervised by experienced TSO experts.

A USB stick containing the course material will be provided.

## OBJECTIVES

To provide participants with an insight into regulatory review and assessment within radioactive waste disposal facilities licensing. It provides an understanding of the safety requirements for geological disposal, the regulatory process for licensing geological disposal facilities, regulatory expectations of the safety case and its systematic review and assessment by the regulatory authority. The course is presented in three modules of one week each.

Module 1 provides a general introduction to the course and deals with the safety case context, safety strategy, site characterization and the facility description.

Module 2 deals with safety assessment, specifically; post closure radiological impact assessment, operational safety assessment, site and engineering assessment and management system assessment.

Module 3 deals with the topics of optimization, uncertainty management, integration of safety arguments and regulatory review and assessment of safety.

## TARGET AUDIENCE

The training course is addressed mainly to technical staff of regulatory authorities, technical support organizations and waste management organizations involved with geological disposal. The course will also be of interest to research organization, consulting organizations and government and non-government organizations dealing with geological disposal of radioactive waste.

## PROGRAM

**Module 1** provides a general introduction to the course and covers:

- the safety and regulatory requirements for the safety case
- the licensing process for geological disposal throughout the stages of site development
- waste and disposal facility information needed for safety demonstration and for supporting research programs and activities

**Module 2** covers:

- safety assessment methodology
- radiological impacts
- engineering and management systems

**Module 3** covers:

- approaches to optimization of operational and post-closure safety
- managing uncertainty in the safety assessment process
- integrating safety arguments into the safety case
- regulatory review and assessment

The overall course also provides an overview of European experience to date in the development and licensing of geological disposal facilities.

## LEARNING OUTCOMES

Insights into and understanding of:

- Safety requirements and regulatory expectations of the safety case the licensing process for geological disposal throughout the stages of development.
- Site, waste and disposal facility information needs for safety demonstration and supporting research programs and activities.
- Safety assessment methodology – covering radiological impact, engineering and management systems.
- Approaches to optimization of operational and post closure safety.
- Management of uncertainty in the safety assessment process.
- Integration of safety arguments within the safety case.
- Regulatory review and assessment.
- European experience in the development and licensing of geological disposal facilities.

## PREREQUISITES

Participants will require a basic knowledge in the area of radioactive waste management, in particular waste disposal; basic knowledge of disposal facilities licensing processes is welcome.

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# My Training Course at IRSN Academy

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## Registration step by step: an educational trip

### 1. I register

- I go online to the IRSN Academy website <https://formation.irsn.fr/en/training-programs/> and choose the course that interests me.
- I click on "Register".
- I create an account on "IRSN Training Application".
- I pay the full amount.

### 2. I follow up my registration

- I will receive an email confirming my registration.
- The required documents need to be sent within 3 days.
- I will receive a Welcome Email.
- I will have to confirm my attendance in a short email to the Training Manager.
- Details are provided in the Welcome Email:
  - The invitation letter, which is sent by the organization that hosts the training.
  - For accommodation, I am responsible for reserving my hotel.
  - A list of hotels near the training location is provided.
  - For transportation, an access map to reach the training location is provided.
  - The training week usually lasts from Monday to Friday.  
Working hours are from 9:00 AM to 5:00 PM.  
IRSN Academy guarantees a 7-hour training day.

### Unforeseen circumstances?

If I cannot attend the training course,  
I send the Training Manager an email that explains why I am cancelling.  
By email: [training-tutoring@irsn.fr](mailto:training-tutoring@irsn.fr)

### 3. D-day

- I arrive at the training location 30 minutes before the training starts.
- Each day I show the gatekeepers my passport and they will give me a badge, which I must return at the end of the day.
- The Training Manager will come to greet me and lead me to the classroom.
- The classrooms are bright and comfortable, and equipped with computers and projectors. I will be given a bag, a flyer, a pen, and a notebook. The course materials will be provided via a USB stick or via the Learning Management System.
- During the break, hot drinks, fruit juices and pastries will be offered.
- Participants and the module leader eat lunch together, in compliance with sanitary measures.
- I must sign the attendance sheet both morning and afternoon.

The Training Manager will distribute an evaluation sheet to complete, preferably after each session.

## 4. To conclude

On the last day of training, I take the knowledge test. I turn in my evaluation sheet to the Training Manager and receive my attendance certificate.

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### Five good reasons to train with IRSN Academy

- *Guarantee of training effectiveness*  
Quality recognized by certification bodies.  
Training limited to 25 participants.
- *Active teaching methods*  
Based on practical, appealing teaching methods.  
Half of the practice involves concrete case studies in small working groups, with quizzes, simulations, scenarios, etc.
- *Team of experienced and dependable trainers*  
An average 15 years' professional experience.  
Nationally and internationally recognized experts in nuclear safety, security and radiation protection.
- *Practical arrangements as close as possible to your needs*  
A customized training course can be organized for your organization.  
Just tell us your needs and expectations, IRSN Academy will plan it.
- *Post-training follow-up*  
After the training course, you can contact the module leader for any question related to the topic of the training course.

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### Our commitment to quality

IRSN Academy's well-established programs, experienced trainers and AFAQ ISO 9001 certified organization are a guarantee of success.

## They trust us

- Agenzia nazionale per le nuove tecnologie, l'energia e lo sviluppo economico sostenibile (ENEA, Italy),
- Atomic Energy Regulatory Board (AERB, India),
- Authority for Nuclear Safety and Radiation Protection (ANVS, Netherlands),
- Autorité de sûreté nucléaire (ASN, France),
- BEL V (Belgium),
- Canadian Nuclear Laboratories (CNL, Canada),
- Canadian Nuclear Safety Commission (CNSC, Canada),
- Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas (CIEMAT, Spain),
- Centrum Výzkumu Řež (CV Řež, Czech Republic),
- Chubu Electric Power Co., Inc (Japan),
- Consejo de Seguridad Nuclear (CSN, Spain),
- Department of Atomic Energy (DAE, India),
- European Commission
- European Commission's Joint Research Center (EC JRC, EU),
- Federal Agency for Nuclear Control (FANC, Belgium),
- Federal Authority for Nuclear Regulation (FANR, UAE),
- Finnish Radiation and Nuclear Safety Authority (STUK, Finland),
- Fusion for Energy (F4E, UE),
- International Atomic Energy Agency (IAEA),
- King Abdullah City for Atomic and Renewable Energy (K.A. CARE, Saudi Arabia),
- Korea Institute of Nuclear Safety (KINS, Korea),
- Lietuvos Energetikos Institutas (LEI, Lithuania),
- MAVINCI A.S. (Turkey),
- National Emergency Crisis and Disasters Management Authority (NCEMA, UAE),
- National Environment Agency (NEA, Singapore),
- Nice University (France),
- Nuclear Material Control Center (NMCC, Japan),
- Nuclear Power Corporation of India Limited (NPCIL, India),
- Nuclear Regulation Authority (NRA, Japan)
- Paul Scherrer Institut (PSI, Switzerland),
- Scientific and Engineering Center for Nuclear and Radiation Safety (SECNRS, Russia)
- Singapore Nuclear Research and Safety Initiative (SNRSI, Singapore),
- State Nuclear Power Safety Inspectorate of Lithuania (VATESI, Lithuania),
- State Nuclear Regulatory Inspectorate of Ukraine (SNRIU, Ukraine),
- State Scientific Technical Center for Nuclear and Radiation Safety (SSTC, Ukraine),
- St.tn. Ústav Radiačn. Ochrany (SURO, Czech Republic),
- TECNATOM (Spain),
- TÜV-NORD (Germany),
- WorleyParsons, Ltd. (Australia).

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## Useful Information

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### Administration information

Corporate Name	IRSN Academy
Address	12 rue de la Redoute – BP 17 92262 FONTENAY-AUX-ROSES CEDEX FRANCE
Information & Registration	<a href="https://formation.irsn.fr/en/training-tutoring@irsn.fr">https://formation.irsn.fr/en/ training-tutoring@irsn.fr</a>
Siret Number (IRSN)	44054601800027
RCS Nanterre	440 546 018
APE/NAF	7219Z
VAT Number	FR68440546018
Training Provider Registration Number	11922413892 (DIRECTE Ile de France)
Bank Name and Address	TRESOR PUBLIC 94 rue Réaumur 75104 PARIS CEDEX 02 FRANCE
IBAN	FR76 1007 1750 0000 0010 0054 885
BIC CODE	TRPUFRP1
Legal Structure	Public Industrial and Commercial Establishment (EPIC)

## General Terms and Conditions of Sale

### 01. DEFINITIONS

**Trainee:** participant benefiting from the training.

**Client:** the Trainee's employer. The Trainee is deemed to be a Client if he is his own employer.

**Inter-company training:** catalog training, carried out on the premises of IRSN Academy or on the premises made available to IRSN Academy.

**Intra-company training:** catalog training produced exclusively for the account of the Client or training tailored on behalf of the Client, on the premises of IRSN Academy, the Client's premises, or the premises made available by the Client or by IRSN Academy.

**General Terms and Conditions of Sale:** refers to this document as reference on the date of December 01, 2021.

### 02. PURPOSE AND SCOPE

The purpose of these general conditions of sale is to define:

- On the one hand, the general conditions for participation in inter-company professional training sessions organized by IRSN Academy;
- On the other hand, the procedures for organizing and carrying out intra-company training sessions by IRSN Academy on behalf of the Client, who is a signatory to the professional training agreement defined below under Paragraph 03. Contractual Documents.

### 03. CONTRACTUAL DOCUMENTS

All orders are based on a professional training agreement drawn up in accordance with article L6353-1 of the French labor code, mentioning the details of the services provided, the price and the terms of payment. IRSN Academy sends the Client this continuing professional training agreement. The Client undertakes to sign it and affix its commercial stamp, then to return an original copy as soon as possible to IRSN Academy.

These general conditions of sale prevail over any other document of the Client, in particular the Client's purchase order and/or its general conditions of purchase.

These general conditions of sale as well as the professional training agreement, the registration form constitute the contract concluded between the parties.

In the event of an interpretation dispute between the various contractual documents, the order of interpretation is as follows:

- These general conditions of sale
- The professional training agreement

### 04. TERMS OF REGISTRATION AND ORDER

Prerequisites:

- The Client ensures and is able to justify that the Trainee has the necessary prerequisites for the training in question. He also verifies the adequacy of the training to the profile and objectives of the Trainee. The Client guarantees the veracity of the information provided. IRSN Academy reserves the right to refuse a Trainee who does not have the required prerequisites of a training.
- Registration for a training session must be done on our website [formation.irsn.fr/en/](http://formation.irsn.fr/en/)

Any registration for a training session must be made within a period of at least one (1) month before the start date of the session.

IRSN Academy reserves the right to accept later registrations.

Any registration by the Client constitutes an order deemed accepted by sending the training agreement signed by the Client and implies its full and complete adherence to these general conditions of sale.

No later than fifteen (15) days before the start of the session, IRSN Academy sends the Trainee a personal invitation by e-mail, which provides all the practical information relating to the session (schedules, means of access, etc.) as well as the rules of procedure and the welcome booklet.

The Client undertakes to communicate to IRSN Academy the e-mail addresses of the Trainees.

#### • Rules of Procedure:

The Client undertakes to ensure that the Trainee respects the internal rules of procedure which are communicated to him at the time of his convocation or at the latest given at the start of the training session.

#### • Certificate of knowledge:

At the end of each training, IRSN Academy undertakes to provide the Trainee a certificate of knowledge, provided that the registration fees have been fully paid by the Client. It is therefore up to the Client to ensure that the registration fees are paid within 30 days of the end of the training.

### 05. INVOICING AND PAYMENT

#### a) Price

Prices are in euros excluding tax, to be increased by the VAT in force and/or any other taxes and/or taxes withheld at source in application of the legislation in force in the country concerned.

Prices are firm and non-revisable.

#### • For inter-company training:

Registration fees cover educational services (teaching, practical work, use of simulators and other computer tools, documentation provided, necessary supplies) as well as meals and coffee breaks.

They do not include any transport and accommodation costs. The prices are indicated on the professional training agreement. Any session started must be paid in full.

#### • For intra-company training:

IRSN Academy gives the Client a quote that includes the details of the prices, the billing and payment schedule. The prices set are exclusive of tax.

#### b) Payment

Payment is made by bank transfer into IRSN's account, whose bank details are as follows:

TRESOR PUBLIC  
94 rue Réaumur  
75104 PARIS CEDEX 02  
FRANCE

Bank domiciliation: TPPARIS  
Account owner: IRSN INST. RADIOPROT. SURETE NUC. /  
AGENCE COMPTABLE

Bank code: 10071

Branch code: 75000  
Account number: 00001000548  
Bank key: 85  
IBAN: FR76 1007 1750 0000 0010 0054 885  
BIC code: TRPUFRP1  
IRSN SIREN number: 440 546 018 00027  
VAT number: FR 68 440 546 018

## 06. CANCELLATION AND POSTPONEMENT

### **a) Cancellation and postponement conditions for inter-company training**

#### **By the Client:**

- Any case of cancellation by the Client must be communicated in writing to IRSN Academy. In case of cancellation within fewer than fourteen (14) working days before the start of the session, 50% of the educational cost is definitively invoiced by IRSN Academy to the Client, except in the event of replacement by a Trainee from the same establishment, confirmed by entering a new registration on our website [formation.irsn.fr/en/](http://formation.irsn.fr/en/)
- In case of a cancellation that is not confirmed in writing (including for absenteeism or abandonment), 100% of the registration fees are definitively invoiced by IRSN Academy to the Client. In the event of an unforeseen departure duly justified by the Client, the Trainee may be admitted to participate in a subsequent session after prior written agreement from IRSN Academy.

#### **By IRSN Academy:**

IRSN Academy reserves the right to cancel or postpone a training session, especially in case of an insufficient number of participants. The Client is informed by e-mail no later than fifteen (15) working days before the date of the session concerned. Payments received will be fully refunded. No compensatory indemnity will be paid to the Client due to a postponement or cancellation by IRSN Academy.

### **b) Cancellation and postponement conditions for intra-company training**

#### **By the Client:**

Any request for cancellation or postponement of all or part of the training service by the Client must be notified by registered letter with acknowledgment of receipt to IRSN Academy no later than fifteen (15) working days before the date of the session concerned. This period is calculated from the date of receipt of the cancellation request by IRSN Academy.

Any postponement notified within a period of less than fifteen (15) working days is considered by IRSN Academy as a cancellation of the said session. The cancellation conditions specified below then apply:

- for the canceled service, including for any service canceled between fifteen (15) working days and seven (7) working days before the date of the session, the Client must pay 50% of the amount of the service.
- for any service canceled less than seven (7) working days before the date of the session, the Client must pay 100% of the amount of the service.

#### **By IRSN Academy:**

IRSN Academy reserves the right to cancel or postpone a session by informing the Client by e-mail, fax or simple letter

no later than fifteen (15) working days before the date of the session concerned, whatever the reason. No compensation will be paid to the Client. IRSN Academy undertakes to propose a new session date within a reasonable time following the cancellation.

## 07. MODIFICATION OF SERVICES

Any modification of the services is subject to an amendment to the professional training agreement.

However, any change in the number of Trainees for a session must be the subject of prior written information to IRSN Academy and subject to the following conditions:

- any downward modification of the number of Client Trainees in a session is considered as a partial cancellation of the services and is in this case managed with regard to the rules set out in article 6, applied to the unit cost per Trainee specified in the quote (or, failing that, obtained by dividing the total amount of the price set in the training agreement by the number of Client Trainees),
- any additional participant is subject to the prior acceptance of IRSN Academy and will be the subject of an amendment to the professional training agreement,
- any request for modification relating to the number of Trainees must be submitted to IRSN Academy no later than seven (7) working days before the start of the session concerned.

In addition, the Client may replace a Trainee with another Trainee of the Client after written notification sent to IRSN Academy.

## 08. COMPUTING AND FREEDOM

The personal information communicated by the Client to IRSN Academy for the execution of the session may be communicated to the contractual partners of IRSN Academy and to the trainers for the purposes of the said service. In accordance with the provisions of French law n°78-17 of January 6, 1978, relating to data processing, files and freedoms, the persons concerned may at any time exercise their right of access, opposition, and rectification in the file of IRSN Academy.

## 09. CONFIDENTIALITY AND PROPERTY RIGHTS OF PEDAGOGICAL DOCUMENTS

The documents communicated during the training session are confidential by nature, regardless of their medium. The Client undertakes to ensure that this obligation is respected by all its staff and more generally for any person whom it has put in contact with IRSN Academy.

All the educational documents and information transmitted by IRSN Academy within the framework of the training sessions belong to IRSN Academy and/or its contractual partners and/or trainers.

Their use, disclosure or copying is prohibited except with the prior agreement of IRSN Academy.

The documents communicated during the training session may not be used for any purpose other than those of training support for the personnel designated by the Client.

These documents are inseparable from the content of the training provided orally by IRSN Academy.

The Client shall refrain from removing the property notices

that appear on the educational documents that IRSN Academy sends under its services.

#### **10. ADVERTISING**

The Client authorizes IRSN Academy to refer to the Client's name and logo as part of its communication operations for training, on any medium.

#### **11. TERMINATION**

If one of the parties does not comply with the obligations arising from the contract, the other party may terminate the contract after formal notice to satisfy it, sent by registered letter with acknowledgement of receipt and without effect within thirty (30) working days following the date of dispatch.

#### **12. SPECIAL CASES**

##### **a) Risk prevention**

When registering for training sessions including practical work using ionizing radiation sources and/or visits to facilities in regulated areas, Trainees must comply with the site's internal regulations, and in particular be the subject of dosimetric monitoring by wearing a passive dosimeter provided by IRSN Academy for the duration of the practical work.

Pregnant or breastfeeding women and people with implanted medical devices are strongly recommended to report to IRSN Academy team and/or the trainer.

##### **b) Disability**

In accordance with IRSN Academy's policy for the integration of people with disabilities, IRSN Academy will endeavor to take into account specific needs when they have been indicated on the Qualification of needs form that the Trainee will have received during registration, which must be returned to IRSN Academy.

#### **13. LIABILITY - INSURANCE**

The civil liability of IRSN Academy is cumulatively limited to:

- Direct damage caused by IRSN Academy to the Client,
- The prices actually paid by the Client under the contract.

The Client and the insurers waive any recourse against IRSN Academy exceeding the amount and damages referred to above.

Furthermore, under no circumstances IRSN Academy can be held liable for any financial, commercial, or other damage caused directly or indirectly by the use of the information provided during the training sessions.

#### **14. MISCELLANEOUS PROVISIONS - DISPUTES**

These general conditions of sale are subject to French law for their interpretation and execution. Any dispute, not resolved amicably between the parties within a period of one (1) month, and relating to the validity, the execution, or the interpretation of these general conditions of sale will be subject to the jurisdiction of the commercial court of Nanterre, France.

#### **15. UPDATE OF THE GENERAL CONDITIONS OF SALE**

The general conditions of sale are likely to be updated. The applicable version is the latest in force on the date of the signature of the professional training agreement.



12, rue de la Redoute - BP 17  
92262 Fontenay-aux-Roses CEDEX  
FRANCE

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Legal deposit: June 2022  
Design and production:  
IRSN Academy - Julien HARDY

**WEBSITE**

[irsn-academy.com/en/](https://irsn-academy.com/en/)

**E-MAIL**

[training-tutoring@irsn.fr](mailto:training-tutoring@irsn.fr)

Coordination and Drafting:

IRSN Academy - Julien HARDY

Proof reading:

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 @IRSNAcademy



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92260 Fontenay-aux-Roses  
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BP 17 - 92262 Fontenay-aux-Roses Cedex

**TELEPHONE**

+33 (0)1 58 35 88 88

**WEBSITE**

[www.irsn.fr/en](http://www.irsn.fr/en)

**E-MAIL**

[contact@irsn.fr](mailto:contact@irsn.fr)

 [@IRSNFrance](https://twitter.com/IRSNFrance)