

Development of a Curriculum of a Master's Degree Programme in Nuclear Safety and Security

Office of Safety and Security Coordination
Department of Nuclear Safety and Security

Background

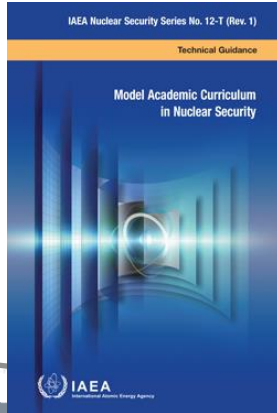
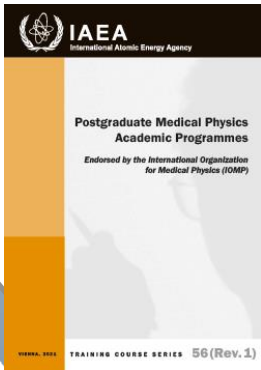
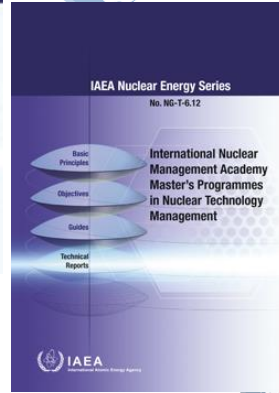
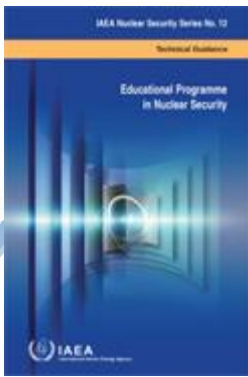
- Developing and/or Strengthening Member States' s capacity in **nuclear safety & security** through Education & Training (E&T) is a **KEY** to ensure the competence for all parties having responsibilities in these two areas;
- **GC (62)/RES/6** on Nuclear and Radiation safety requests the Secretariat to strengthen & expand its programme of E&T activities focusing on building institutional, technical, managerial and leadership capabilities in MS;
- IAEA Nuclear Security Plan 2018-2021 (**GC (61)/24**) encourage the Secretariat to continue its efforts to provide E&T training opportunities in nuclear security;



Background

Agency has made available different curricula (examples):

- Educational Programme in Nuclear Security, IAEA Nuclear Security Series No. 12, IAEA, Vienna (2010);
- Nuclear Engineering Education: A Competence Based Approach to Curricula Development (Nuclear Energy Series No. NG-T-6.4, 2014);
- International Nuclear Management: Academy Master's Programmes in Nuclear Technology Management (IAEA Nuclear Energy Series No. NG-T-6.12, 2020)
- Postgraduate Medical Physics Academic Programmes (Training Course Series No. 56 (Rev. 1), 2021);
- Model Academic Curriculum in Nuclear Security (Nuclear Security Series No. 12 (Rev 1), 2021).



Background

In addition, the Agency is providing other long terms training courses such as:

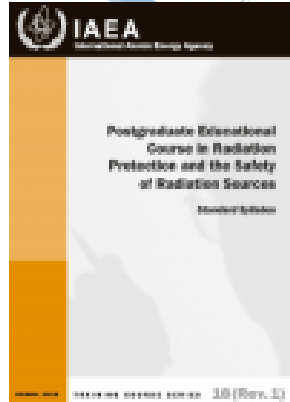
- Training Curriculum for Nuclear Medicine Physicians, IAEA-TECDOC-1883 (2019);
- Postgraduate Educational Course in Radiation Protection and the Safety of Radiation Sources (Training Course Series No. 18 (Rev. 1), 2019);
- Basic Professional Training Course on Nuclear safety (BPTC), 2015; and
- Regulatory Control of Nuclear Power Plants (Training Course No. 15, 2002)

IAEA TECDOC SERIES

IAEA-TECDOC-1883

Training Curriculum for Nuclear Medicine Physicians

IAEA-TECDOC-1883



Analysis

Advisory Missions
Peer Review Missions

Nuclear Safety Reports
2015, 2016 and 2017

- One of the main weaknesses and shortcomings is the **lack of sufficient competent and experienced staff** with responsibilities in nuclear safety and security.
- The above situation has been attributed to **the lack and/or insufficient national infrastructure for E&T**, in particular universities or other academic institutions offering academic E&T in nuclear safety and security at the national, regional or international level.
- An increasing number of MS are **seeking support** from IAEA to assist them in establishing and/or strengthening their own **national postgraduate Master's education programmes**.

Objectives of this Master's Degree programme will be:



Assist and provide guidance to universities, academic institutions, nuclear safety and security's trainers, human resources managers at organizations and institutions responsible for **E&T in nuclear safety and security** in MS for the development of a curriculum of a Master's Degree programme responding to their national needs in these two areas;



- Each academic institution to develop its own unique programme tailored to suit the State's needs for E&T in nuclear safety and security.
- Enhancing the ownership of the national E&T in nuclear safety and security by MS and strengthen the partnership with IAEA.

Scope

- **Nuclear**
 - **Radiation**
 - **Waste**
 - **Transport**
 - **Safety**
 - **EPR**
 - **Nuclear Security**
- This programme shall cover all topics.
 - It shall outline the learning objectives (contents, courses and subjects), and the learning outcomes and related competences that are sought in such educational programme.
 - It shall provide keys considerations to universities and academic institutions in developing the type of curriculum that meet their national needs in nuclear safety and security

Present Situation



The DPP for the development of the publication relating to this Master's Degree Programme has been approved;



Development of draft curriculum completed. The development of this document has been initiated at NS Department Project and involved all NS entities (NSOC, NSRW, NSNI, NSNS and IEC);



It is being developed with the support of all TC Divisions;



Many countries have already expressed their interest and are requesting the Agency support for its establishment in their academic institutions.

Goal

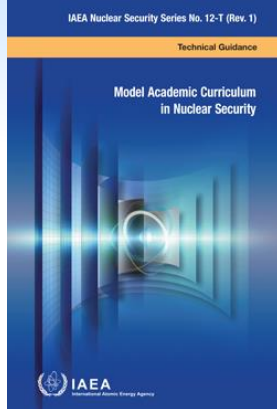
- Curriculum for Master's Degree in Nuclear Safety and Security
- Technical Report (Technical Document) to assist Member States to adopt and adapt the application of curriculum according to their needs

Example:

Technical Guidance:

Model Academic Curriculum in Nuclear Security

IAEA Nuclear Security Series No. 12-T (Rev. 1)



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1. Introduction
2. Master's Degree Program with description of modules
3. Notional path
4. Methodology
5. Challenges

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Modules for:

Introduction

Fundamentals

Common

Radiation Safety

| | | |
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Modules for:

Nuclear Safety

Nuclear Security

| | |
|--|-----|
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Example

RSAE2: Emergency exposure situations and emergency preparedness and response

1. Short description
2. Learning objectives
3. Main topics
4. Exercises
5. Laboratory work
6. Methods of assessment
7. References

Steps

- Internal review – 31st May 2022 - Done
- External review – 30th Nov. 2022
- Technical Report – 31st Dec. 2022

Modules for an Academic Curriculum in Nuclear Safety and Security

- (a) FUNR1: Basic physics and mathematics used in radiation safety, nuclear safety and security.
- (b) FUNR2: Interaction of radiation with matter.
- (c) FUNR3: Sources of radiation and basic concepts of radiation protection.
- (d) FUNR4: Quantities and units.
- (e) FUNR5: Radiation detection and measurements.
- (f) FUNR6: Biological effects of radiation.
- (g) FUNR7: Nuclear fuel cycle.

- (a) COMR1: International Legal Instruments (incl. International Cooperation).
- (b) COMR2: Governmental, Legal and Regulatory Framework.
- (c) COMR3: Safety and Security Principles and Interface.
- (d) COMR4: Safety and Security in Transport.
- (e) COMR5: Waste Safety and Security.
- (f) COMR6: Emergency Preparedness and Response.
- (g) COMR7: Nuclear Safety and Security Management and Culture.

- (a) NSEE1: Threat Assessment and Risk Informed Approach to Nuclear Security.
- (b) NSEE2: Nuclear material accounting and control (NMAC) for Nuclear Security Purposes.
- (c) NSEE3: Detection of Materials Out of Regulatory Control: National Detection Architecture (NDA), Technologies and Equipment, and Nuclear Security Framework for Major Public Events (MPE).
- (d) NSEE4: Response to Nuclear Security Event Involving MORC: Radiological Crime Scene Management and Nuclear Forensic Analysis.
- (e) NSEE5: Computer and Information Security in the Nuclear World.
- (f) NSEE6: Physical Protection Principles, System Design, Technologies, and Equipment for Nuclear and Other Radioactive Materials and Facilities.

- (a) NSO: Introduction to Nuclear Safety and Security.

- (a) NSPR1: Ionizing Radiation, Safety and Radiation Protection.
- (b) NSPR2: Methods and Instruments for Nuclear and Other Radioactive Material Measurements.
- (c) NSPR3: Nuclear Energy, Nuclear Fuel Cycle and Nuclear Applications.
- (d) NSPR4: Methods of Scientific Research.

- (h) RSAE1: Planned exposure situations.
- (i) RSAE2: Emergency exposure situation and emergency preparedness and response.
- (j) RSAE3: Existing exposure situations.
- (k) RSAE4: Practical application of radiation protection.

- (a) NSFE1: Nuclear Safety Fundamentals.
- (b) NSFE2: Design of Nuclear Reactor Safety and Supporting Systems.
- (c) NSFE3: Reactor Kinetics, Dynamics, Control and Fuel Management.
- (d) NSFE4: Reactor Thermal Hydraulics.
- (e) NSFE5: Operational Safety, Commissioning and Compliance.
- (f) NSFE6: Deterministic Safety Assessment (DSA).
- (g) NSFE7: Probabilistic Safety Assessment (PSA).
- (h) NSFE8: Regulatory Control.
- (i) NSFE9: Severe Accident Assessment Methodology and Tools.
- (j) NSFE10: Nuclear Installations Siting and Environmental Assessment.
- (k) NSFE11: Decommissioning Safety Methodology.

Thesis/Final Project



IAEA

International Atomic Energy Agency
Atoms for Peace and Development

Thank you!

