

# Aalto Nuclear Safety

**Code:** SCI3074

**Extent:** 20-25 cr

**Language:** English / Finnish

**Teacher in charge:** Filip Tuomisto

**Target group:** The ANS minor is offered to all master-level students of the Aalto University schools of technology (SCI, ENG, ELEC, CHEM). International students are welcome.

**Application procedure:** See detailed information at the end of the description.

**Quotas and restrictions:** No quotas. The minor is targeted only for master students.

**Prerequisites:** BSc in science or engineering

## Content and structure of the minor

### Goal

The goal of the Aalto Nuclear Safety minor is to provide the student with a multidisciplinary view on nuclear safety from the engineering perspective both in national and international contexts.

### Scope

Finland and the EU are strongly committed to the safe and efficient use of nuclear energy as a part of targeting carbon-neutral society. Depending on the progress of the ongoing and planned projects, the need for personnel with higher education in the nuclear energy sector in Finland is 1200 – 2400 people during 2015 – 2025.

The Aalto Nuclear Safety minor (ANS) is an elective minor for students of the Aalto University schools of technology (School of Science, School of Engineering, School of Chemical Technology, School of Electrical Engineering). It is run by the Aalto Nuclear Innovation and Safety program that joins the efforts across schools ([http://www.aalto.fi/en/research/platforms/energy/studies/#nuclear\\_program](http://www.aalto.fi/en/research/platforms/energy/studies/#nuclear_program)). Studies in the minor are tailored for each student to complement their major studies in the most effective way. The main goal is to provide the student with complementary knowledge on the specific issues related to nuclear energy and nuclear safety in other engineering disciplines than those of the major.

### Collaboration

The minor is organised in close collaboration between the schools of technology. The contact persons for each school are: Prof. Filip Tuomisto (SCI), Prof. Sanna Syri (ENG), Prof. Simo-Pekka Hannula (CHEM), Prof. Liisa Haarla (ELEC).

In the national context, selected courses provided by Lappeenranta University of Technology and the Laboratory of Radiochemistry of the University of Helsinki can be included in the minor (see details below). Internationally, students in the minor can take courses available through the European Nuclear Education Network ENEN (<http://www.enen-assoc.org>). An additional benefit provided by ENEN is the European Master of Science in Nuclear Engineering Certification EMSNE (requires a 300 ECTS-MSc-level degree where 60 ECTS are in nuclear sciences and technology, preferably engineering including a MSc thesis project in the nuclear field, and 20 ECTS need to be earned in a country other than that of the home university).

### Structure of the minor

The ANS minor has a two-level structure. The first part contains two courses common to all students. The credits for the portfolio can be awarded only after all the other courses towards the minor have been passed.

The second part consists of courses provided by several MSc programmes. The students will choose 14-24 credits from the course list, so as to meet the required extent of 20/25 cr. Note that individual courses may have special prerequisites, group size limits and separate application procedures. The course list needs to be agreed on with the professor in charge of the ANS minor. Also other nuclear-relevant courses may be included, as agreed on with the professor in charge of the ANS minor.

Code	Name	Credits	Period
Compulsory courses		6	
PHYS-C6360 *	Johdatus ydinenergiatekniikkaan	5	III - IV
PHYS-E0564	Nuclear competence portfolio	1	I - V
* If this course or equivalent knowledge has already been included in the BSc degree (in the latter case approval of the professor in charge of the ANS minor required), there is no need for replacement courses. If needed, the course can be passed in English through individual assignments.			
Elective courses			
Choose courses from the following list until the minimum requirement of 20 cr or 25 cr is met.			
<i>Physics-oriented courses:</i>			
PHYS-C0360	Säteilyfysiikka ja -turvallisuus	5	I - II
PHYS-E0460	Introduction to Reactor Physics	5	I - II
PHYS-E0463	Fusion Energy Technology	5	III - IV
PHYS-E0562	Nuclear Engineering, advanced course	5	I - V - V
PHYS-E0563	Fundamentals of Plasma Physics for Space and Fusion Applications	5	III - V
PHYS-E0565	Programming course on Monte Carlo particle transport simulations	5	I - II
PHYS-E0544	Individual Studies in Physics	1-10 (content to be agreed separately)	I, II, III, IV
<i>Organization and systems-oriented courses:</i>			
TU-E3150	Safety Management in Complex Sociotechnical Systems	5	I - V - V
TU-E3020	Knowledge Management in Practice	5	I - II
TU-E3030	Collaboration in Networks	5	I - II
MS-E2117	Riskianalyysi	5	II - I - IV
CS-E4520	Computer-Aided Verification and Synthesis	5	II - I - IV
ELEC-C1230	Säätötekniikka	5	II - I - IV

<b>ELEC-E8110</b>	Automation Software Synthesis and Analysis	5	
<i>Engineering-oriented courses:</i>			
ENY-C2001	Termodynamiikka ja lämmönsiirto	5	I- II
EEN-E1020	Heat transfer	5	II
EEN-E2001	Computational Fluid Dynamics	5	II I- IV
EEN-E3006	Energy Markets	5	I
<b>CIV-E3050</b>	Fire dynamics and simulation	5	III
ELEC-C6001	Sähköenergiatekniikka	5	I V - V
ELEC-E8413	Power Systems	5	I- II
ELEC-E8406	Electricity Distribution and Markets	5	II I- IV
<b>CHEM-E5215</b>	Materials for Nuclear Power Plants	5	II I- IV

Suitable courses from other Finnish universities (available through the flexible study right (JOO) if the school of the student approves the JOO application) are listed in the following. Note that individual courses may have special prerequisites, group size limits and separate application procedures.

Code	Name	Credits
<i>Thermal hydraulics, Lappeenranta University of Technology:</i>		
BH30A1900	Thermal Hydraulics of Nuclear Power Plants	3
BH30A2000	Modelling of Thermal Hydraulics of Nuclear Power Plants	3
BH30A2200	Experimental Nuclear Thermal Hydraulics	3
<i>Radiochemistry, University of Helsinki:</i>		
55733	Chemistry and Analysis of Radionuclides	7
55741	Chemistry of the Nuclear Fuel Cycle	3
55745	Chemistry of the Final Disposal of Spent Nuclear Fuel	3

Suitable courses from ENEN members (international studies) are agreed on separately.

### Applying to the Aalto Nuclear Safety Minor

You can apply to the Aalto Nuclear Safety minor (master level) at any time.

[Instructions on how to apply:](#)

1. Add the ANS minor to your Personal Study Plan (HOPS).
2. Contact the professor of your major or the planning officer of your degree programme to make sure that they approve including ANS in your personal study plan and your degree.
3. Send your study plan as a PDF-file via email to the professor in charge of ANS and agree on a short face-to-face discussion about the study plan.
4. Apply/register for each individual course separately. Different courses have different application procedures and deadlines so read the course web pages carefully.

Please note the following:

ANS does NOT guarantee that you are admitted on all courses that are part of your study plan. Always contact your degree programme staff or your professor to make sure that they approve including ANS in your study plan and your degree. Each student is personally responsible for obtaining this approval.