

Questionnaire (version of October 2023)

## Natural-Science Disarmament Courses

### Course Description

Time when course was/is given (years)	2022, 2023
Lecturer(s)	Moritz Kütt, Prof. Dieter Horns
Institution (department, university)	IFSH / University of Hamburg
Course Title	Astroparticle physics and verification of nuclear disarmament
Type (lecture, seminar ...)	Seminar
Language(s)	German
Time (number of hours (45 or 60 minutes?) per week, no. of weeks, no. of days if block, how often per year)	2 hours per week
Audience (students of which disciplines, interdisciplinarity)	Physics undergraduates
Credits given	3
- for what (oral/written exam ...)	Presentation in Seminar
Status in department/university/ field of study, obligatory or voluntary	Obligatory (students have to select a number of seminars)
Connection with other course(s)/ integration in field of study	Students learn basics of verification methods & fundamental aspects of nuclear disarmament
Additional activities/material (Model UN, visits, invited speakers, videos, ...)	-
Presentations/papers available, to whom	-
Internet site of course	-
Curriculum/list of units (add below or attach)	
Filled in by	Moritz Kütt
Date	October 21
Agreement to publish this	yes

### Units

1. What are cosmic rays?
2. Cosmic rays in the interplanetary space
3. Atmospheric Muons
4. Muon Tomography
5. Counting Nuclear Weapons using Muons
6. Atmospheric Neutrons

7. Detecting Nuclear Weapons Using Neutrons
8. Neutronmultiplicity Measurements
9. Cosmic neutrinos
10. Reactor Anti-Neutrino Anomaly
11. Reactor Safeguards using Neutrinos
12. Safeguards for Submarines
13. Gamma Spectroscopy of Nuclear Weapons
14. Active Neutron Interrogation for the Detection of Fissile Materials
15. Warhead Authentication using „Zero-Knowledge Proofs“