

Questionnaire (version of October 2023)

### Natural-Science Disarmament Courses

#### Course Description

Time when course was/is given (years)	2023/24 -
Lecturer(s)	Francesco Forti
Institution (department, university)	University of Pisa, Dept of Physics
Course Title	Nuclear Weapons, Disarmament, and Proliferation
Type (lecture, seminar ...)	Lecture
Language(s)	Italian, course material in English
Time (number of hours (45 or 60 minutes?) per week, no. of weeks, no. of days if block, how often per year)	4 hours (45 min) per week, 12 weeks, once a year in the second semester
Audience (students of which disciplines, interdisciplinarity)	Physics BSc and MSc, Nuclear Engineering, Science for Peace, PhD students
Credits given	6 ECTS
- for what (oral/written exam ...)	Oral exam following a brief seminar
Status in department/university/ field of study, obligatory or voluntary	Voluntary
Connection with other course(s)/ integration in field of study	
Additional activities/material (Model UN, visits, invited speakers, videos, ...)	Some invited speaker every year
Presentations/papers available, to whom	Open to everybody
Internet site of course	<a href="https://elearning.df.unipi.it/course/view.php?id=603">https://elearning.df.unipi.it/course/view.php?id=603</a>
Curriculum/list of units (add below or attach)	<p>The course will provide competence on the structure and working principle of nuclear weapons, on the current state of their deployment, on the treaties that regard nuclear weapons and on the risks that humanity is taking as a consequence of the presence of nuclear weapons.</p> <p>The student will be able to discuss critically the possible effects of nuclear conflicts putting them in the context of the current treaties. (S)he will learn to find materials from online bibliographical sources and evaluate the reliability level.</p> <p>Acquired skills are verified through the discussion during classes and a report that each student will prepare on an agreed topic for the final exam.</p>
Filled in by	Francesco Forti
Date	May 7, 2024
Agreement to publish this	YES

#### Syllabus

Module 1 (6 hours). Principles of operation of nuclear weapons. Various types of nuclear weapons (fission bombs, thermonuclear bombs). Effects of nuclear weapons. Hiroshima and Nagasaki. Damage resulting from nuclear tests on the surface or in the air (Marshall Islands, Semipalatinsk test site in Kazakhstan).

Module 2 (6 hours). Global distribution of nuclear weapons. The first treaties regulating (or prohibiting) the possession and testing of nuclear weapons. The NPT (Non-Proliferation Treaty) and treaties that prohibit nuclear tests. The historical excursus that led to the first treaties on nuclear weapons will also be briefly discussed, including the peculiar role of the Cuba crisis.

Module 3 (6 hours). Ballistic missiles and other nuclear weapon delivery systems. Outline of anti-missile defense systems. The ABM Treaty. Evolution of nuclear strategies of countries possessing nuclear weapons.

Module 4 (4 hours). Different types of nuclear reactors and the relationship between civilian and military use of nuclear energy. Methods of uranium enrichment and plutonium separation. Notes on the safety of nuclear plants, on the risks and related accidents (Mayak, Three Miles Island, Chernobyl, Fukushima).

Module 5 (4 hours). Nuclear safety and institutions that control the nuclear activities of various countries (in particular the IAEA in Vienna). Structure of the agreements between individual member countries of the IAEA (and of the NPT) and the IAEA itself. The particular role of the additional protocol.

Module 6 (4 hours). The most important controversies on the nuclear issue (including the Iranian nuclear issue). Countries that possess nuclear weapons and that are not parties of the non-proliferation treaty: (Israel, India, Pakistan, North Korea). Current risks of nuclear proliferation, Nuclear Weapon Free Zones.

Module 7 (6 hours). The recent treaties between the USA and the USSR/Russia for the control of nuclear weapons. The problem of general nuclear disarmament, the role of the UN. International law issues concerning nuclear disarmament. The particular problem of nuclear sharing. Analysis of current risks associated with nuclear weapons. Prospects for the elimination of nuclear weapons.

The invited speakers are in addition to the module hours. There are also some hours devoted to discussion and interaction with students.