Synopsis of AMC Teaching Workshop / Collecting disarmament courses

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The Increasing Danger of Nuclear Weapons: How Physicists Can Help Reduce the Threat
International Centre for Theoretical Physics
Trieste, Italy

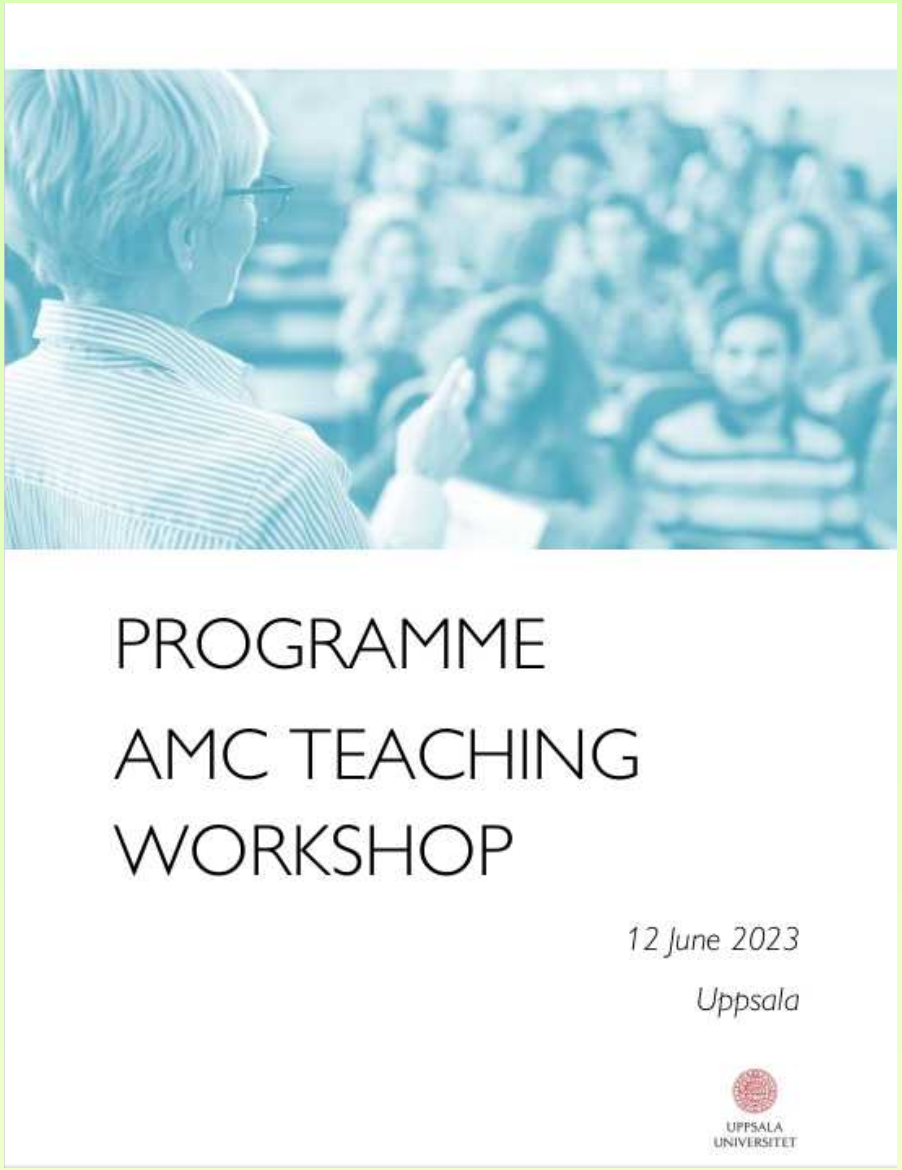
25 October 2023

1. Teaching Workshop

Alva Myrdal Centre for Nuclear Disarmament (AMC)

Uppsala University

Sweden



HOW TO TEACH CROSS-DISCIPLINARY COURSES ON NUCLEAR DISARMAMENT
Malte Göttsche, RWTH Aachen University
Matthias Grosse-Perdekamp, University of Illinois Urbana-Champaign
Masako Ikegami, Tokyo Institute of Technology

ETHICS AND DIVERSITY
Brianne Gutmann, San Jose State University
Karim Haggag, American University in Cairo
Akanshya Gurung, former Consultant SIPRI / Catherine Eschle, University of Strathclyde

WHAT TO TEACH IN CROSS-DISCIPLINARY COURSES ON NUCLEAR DISARMAMENT
Moritz Kütt, Institute for Peace Research and Security Policy, Hamburg
Jürgen Altmann, TU Dortmund University
Anastasia Malygina, St Petersburg University

CHALLENGES TO CROSS-DISCIPLINARY EDUCATION ON NUCLEAR DISARMAMENT
Curtis Asplund, San Jose State University
Anne Harrington, Cardiff University

Example 1

Matthias Grosse-Perdekamp, University of Illinois Urbana-Champaign

The Global Studies/Physics 280 course is offered at the University of Illinois and has been taught since 1982. Its primary objective is to create educated citizens in regards to nuclear armament. The course aims to provide students with a basic understanding of the nature of weapons, the threats posed to humanity, and the potential avenues for reducing these threats.

The course was initially developed during the height of the Cold War. It was a collaborative effort among interdisciplinary faculty members from nuclear engineering, political science, and physics who shared a belief in the necessity of such a course.
The course is open to students from all departments, however, approximately half of the students enrolled come from engineering departments, while the rest represent various social sciences, humanities, fine arts, and a substantial number of global studies students.

The involvement of teaching assistants (TAs) from diverse backgrounds is crucial for fostering cross-disciplinary debates and engagement among students. The course typically has 5-6 TAs working in writing labs.

The writing component of the course is one of the main ways to get students to work cross-boundary in an interdisciplinary way. The research essay, for instance, involves forming ad-hoc teams of students from different areas to conduct peer reviews. Similarly, the research project entails working in teams of 2-3 students, from both technical and non-technical backgrounds.

The research paper in the course is around 5-6 pages, and students have the freedom to choose their own topics.

The course counts towards a certificate in security, offered through ACDIS, the interdisciplinary programme at UIUC for Arms Control & Domestic and International Security.

Global Studies/Physics 280 at the University of Illinois
Nuclear Weapons and Arms Control for students in STEM, Social Sciences, and the Humanities
https://courses.physics.illinois.edu/phys280/sp2023/course-description.html

Example 2

Masako Ikegami, Tokyo Institute of Technology

The Advanced Nuclear 3S Education and Training (ANSET) Program was established in 2017 at the Tokyo Institute of Technology. Tokyo Tech received financial support from the Japanese Nuclear Regulation Authority to create the 3S programme, which stands for safety, security, and safeguards.

The ANSET programme aims to foster the next generation of leaders with comprehensive knowledge in the areas of safety, security, and safeguards (3S). All students have a technical background, but it is also open to young professionals. The programme is given in English, and approximately 40% of the students are foreigners.

The programme is given at a postgraduate level and includes a combination of lectures, exercises, and an internship – providing students with hands-on experience and practical training in nuclear security.
The programme also incorporates more practical aspects such as disaster response and plant cybersecurity (in collaboration with Mitsubishi Heavy Industries), which allows students to gain intensive experience over a two-day period of how to deal with these situations. Many senior nuclear engineers who experienced the Fukushima disaster contribute their practical experiences and knowledge to the course.

The Politics of Nonproliferation course begins by providing historical context, such as the Manhattan Project and it presents challenges to the idea that the atomic bombs were necessary to make Japan surrender. In the course, the geopolitical context of nuclear technology is explored, including discussions on the agenda to secure pure uranium in the DRC. Students are taught about how and why the International Atomic Energy Agency (IAEA) was created. The course also covers the strategic and security implications of nuclear technology to foster good leadership and decision-making. In this section, instances of failed or insufficient control, such as recent examples involving Russia and China, are addressed.

From a science, technology, and society perspective, students are taught that nuclear power plants are among the primary targets in conflicts, as seen in Ukraine. Additionally, the course covers the threats of nuclear terrorism and cyber-attacks.

The Advanced Nuclear 3S Education and Training (ANSET) Program at Tokyo Institute of Technology
https://anset-cp.zc.iir.titech.ac.jp/en/

Remarkable

Explicitly discussing ethics
… using case studies

Unusual teaching formats
… simulations, video films, ...

Interdisciplinary exchange among students
… forming pairs from different disciplines

Gender issues, colonial traces

Takeaways

Takeaway 1: Current efforts to teach university students about nuclear weapons, especially their ethical aspects, are fragmented and spread across many kinds of departments using a variety of methods.

Takeaway 2: Successful cross-disciplinary efforts exist, see the courses at the University of Illinois and the Tokyo Institute of Technology.

Takeaway 3: We would all benefit from further development of these curricula, using modern, evidence-based teaching methods, and informed by research in gender studies, social science, and Physics Education Research (PER). It can be framed as an opportunity to collaborate with political scientists, social scientists, and education researchers.

2. Collecting disarmament courses

After workshop: special meeting on natural-science disarmament courses (7 people)

Form an informal network

Collect information on natural-science disarmament courses

Make information available for others intending to take up such courses

Later maybe with funding: systematise course development

Questionnaire (version of October 2023)

Natural-Science Disarmament Courses

Course Description

Time when course was/is given (years)	Summer term, 2018 - today
Lecturer(s)	Malte Göttsche
Institution (department, university)	Physics, RWTH Aachen University
Course Title	Approaches to Current Arms Control Challenges
Type (lecture, seminar ...)	Seminar
Language(s)	English
Time (number of hours (45 or 60 minutes?) per week, no. of weeks, no. of days if block, how often per year	90 minutes per week, 12 weeks
Audience (students of which disciplines, interdisciplinarity)	Physics and Political Science
Credits given	5 ECTS (physics), 10 ECTS (Political Science)
- for what (oral/written exam ...)	Oral presentation, Po.Sc. additionally term paper
Status in department/university/ field of study, obligatory or voluntary	Voluntary

Connection with other course(s)/ integration in field of study	Module in the M.Sc. Physics and M.Sc. Political Science curricula
Additional activities/material (Model UN, visits, invited speakers, videos, ...)	Includes one or two guest lectures (e.g. from the Bundeswehr Verification Centre)
Presentations/papers available, to whom	
Internet site of course	
Curriculum/list of units (add below or attach)	
Filled in by	Malte Göttsche
Date	23 October 2023
Agreement to publish this	yes

Units

Different every year. Example from 2022:

1. Nuclear weapons and (in-)security
2. Arms race and arms control
3. Verification and confidence-building in arms control
4. The nuclear dimensions of the war in Ukraine
5. Arms control – chances and necessities after the Ukraine War
6. International nuclear governance
7. The verification regime of the IAEA: between politics and technology
8. Nuclear programs in the Middle East
9. Humanitarian consequences and nuclear disarmament
10. Preparing for the future: Verification of future arms control agreements
11. Security and nuclear weapons in North East Asia

Resources for Physics Courses in (Nuclear) Arms Race / Disarmament

Text books:
Craig, Paul P. & Jungerman, John A.: Nuclear Arms Race: Technology and Society. New York: McGraw-Hill, 1985.
Schroeer, Dietrich: Science, technology, and the nuclear arms race. New York: Wiley, 1984.
Garwin, Richard L. & Charpak, Georges: Megawatts + Megatons – The Future of Nuclear Power and Nuclear Weapons. Chicgo: University of Chicago Press, 2002.
Hafemeister, David: Physics of Societal Issues – Calculations on National Security, Environment and Energy. 2nd edition. Cham etc.: Springer, 2014.

Very comprehensive list of 116 books/articles, c. 30 web sites:
Alexander Glaser and Zia Mian: Resource Letter PSNAC-1: Physics and society: Nuclear arms control. Am. J. Phys. 76 (1), January 2008.
https://doi.org/10.1119/1.2800356
[second edition of Hafemeister book not yet included]

Text book on computer science, war and peace:
Christian Reuter (ed.): Information Technology for Peace and Security – IT Applications and Infrastructures in Conflicts, Crises, War and Peace, Wiesbaden: Springer Vieweg, 2019.

Continue

Status 23 Oct. 2023: 5 questionnaires

Expecting c. 20 more

Publish on web site (EU Non-Proliferation and Disarmament Consortium?)

With list of recommended literature

If you know of courses: please address me