

Conrad Grebel University College / University of Waterloo

## PACS 315: Engineering and Peace

Fall 2018 (rev. 26 September 2018)

Class Time:	Wednesdays 7:00-9:50 PM
Location:	Room 1302, Conrad Grebel University College <sup>1</sup>
Instructor:	Paul Heidebrecht
Office Hours:	Wednesdays 3:30-4:30 PM or by appointment
Office Location:	Room 4203, Conrad Grebel University College
Phone:	519-885-0220 Ext. 24225
Email:	<a href="mailto:pheidebr@uwaterloo.ca">pheidebr@uwaterloo.ca</a> (best way to reach me)

### Course Description:

This course is built on the conviction that the kinds of problems engineers seek to address, and the ways they seek to address them, should matter for anyone interested in advancing peace in the world. Topics include: historical connections between the discipline of engineering and warfare, understanding the engineering method and mindset, and technological frontiers for peacebuilding.

Intended to test the foundational assumption of the University of Waterloo's Peace and Conflict Studies program—that peace is everybody's business—initial offerings of this course verified that PACS has something important to offer to the field of engineering, and that engineering as a discipline has something important to contribute to the advancement of peace. This course is also intended to encourage and equip students to tackle pressing social challenges through other curricular (e.g., Capstone Design or Senior Research projects) and co-curricular (e.g., co-op work terms or entrepreneurship programming) offerings at Waterloo.

### Course Learning Outcomes:

By the end of the term, students should be able to:

1. clearly articulate why peace is the business of engineers;
2. augment their approach to analyzing and solving problems with insights from both engineering and peacebuilding theory and practice;
3. convince non-engineers that engineers can contribute to building sustainable peace; and
4. identify opportunities to apply their expertise and passions to make a meaningful social impact.

### Required Reading Materials:

Required readings for each class are highlighted in the weekly course outline and course bibliography that follows, and are all accessible online or via LEARN. The length will vary from week to week.

In addition, students will also be required to sign up for and read the “Weekly Roundup” e-mail from the PeaceTech Lab based in the U.S. Institute for Peace in Washington, DC, which highlights stories on technology, media, and data in peacebuilding: <http://www.peacetechlab.org/news-roundup-signup>

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<sup>1</sup> This class meets on the traditional territory of the Attawandaron (also known as Neutral), Anishinaabe and Haudenosaunee peoples. Conrad Grebel University College and the University of Waterloo are situated on the Haldimand Tract, land promised to the Six Nations that includes 10 kilometres on each side of the Grand River.

## Guest Speakers:

Each class will begin with a conversation with a guest speaker that relates either to the topic of the day or to the overall learning outcomes for the class. These individuals have unique expertise and life experiences to share; they also have busy schedules, and so the roster of guests is subject to change on short notice.

## Course Assessment:

Element	Weighting	Due Date
In-class Assignments	50% (best 10 of 12 x 5% each)	Weekly
Course Engagement	25%	Various
Final Exam	25%	Dec. 14

## Additional Assignment Instructions:

### (i) In-class Assignments

Every class session will include an assignment that will require students to work individually and/or in teams to address a problem or complete an exercise related to the topic of the day. This will be a major component of student evaluation, and detailed instructions will be provided for each individual assignment. Assignments will NOT be accepted for any missed classes. The assessment rubric is as follows:

- 60% – Met the minimum expectations for the assignment
- 75% – Demonstrated a meaningful level of engagement with the assignment
- 90% – Made a contribution that went above and beyond expectations

### (ii) Course Engagement

Assessment of engagement will utilize a [specifications grading](#) approach, which aims to better align the evaluation of student performance with the learning outcomes intended for this course. Each engagement activity level is graded pass/fail, and the overall course engagement grade will be based on the number of levels that students complete successfully, as noted below:

Level 1: 60% – All class surveys submitted

- Provide feedback on course topics, readings, guests, and assignments via surveys posted on LEARN throughout the semester.

Level 2: 70% – Level 1 successfully completed + active contributions to class discussions

- Submit one or two relevant and probing questions via e-mail by noon on the day of class for at least four assigned readings *and* at least one guest speaker.

Level 3: 80% – Levels 1 and 2 successfully completed + participation in one campus or community event

- Submit a report via LEARN (and, when time permits, orally) on a campus or community event attended that was related to a topic discussed in class (due by Nov. 21).

Level 4: 90% – Levels 1, 2, and 3 successfully completed + extended reading

- Submit a book review via LEARN for one of the books listed in the “Extended Reading Bibliography” at the end of this syllabus (due by Nov. 28).

Level 5: 100% – Levels 1, 2, 3, and 4 successfully completed + one of the following options:

- Participate in the Quantum Valley Investments Problem Pitch Competition (applications for “Billion Dollar Problems” due Sep. 30): <http://velocity.uwaterloo.ca/problempitch/>; or
- Submit an entry into the University of Waterloo’s HeForShe writing contest (due Oct. 1): <https://uwaterloo.ca/heforshe/heforshe-writing-contest>; or
- Publish an Op Ed or article in an on-campus or community newspaper that answers the question: “Why is peace the business of engineers?” (published by Nov. 28).

## Additional Assignment Instructions, continued:

### (iii) Final Exam

This class will conclude with a take-home final exam distributed at the end of class on November 28; answers must be submitted via LEARN by the end of the day on December 14. The exam will be composed of essay questions that provide the opportunity to demonstrate your own knowledge of the topics and readings encountered throughout this course, and insights you have gleaned from class discussions and assignments. Evaluation will also be based on the overall presentation and organization of your answer, including sentence structure and mechanics.

## Additional UWaterloo Course Policies:

**Academic Integrity:** In order to maintain a culture of academic integrity, members of the University of Waterloo are expected to promote honesty, trust, fairness, respect and responsibility. See the [Office of Academic Integrity webpage](#) for more information.

**Discipline:** A student is expected to know what constitutes academic integrity, to avoid committing academic offences, and to take responsibility for his/her actions. Check [the Office of Academic Integrity](#) for more information. A student who is unsure whether an action constitutes an offence, or who needs help in learning how to avoid offences (e.g., plagiarism, cheating) or about “rules” for group work/collaboration should seek guidance from the course professor, academic advisor, or the Undergraduate Associate Dean. When misconduct has been found to have occurred, disciplinary penalties will be imposed under Policy 71 – Student Discipline. For information on categories of offenses and types of penalties, students should refer to [Policy 71 - Student Discipline](#). For typical penalties check [Guidelines for the Assessment of Penalties](#).

**Grievance:** A student who believes that a decision affecting some aspect of his/her university life has been unfair or unreasonable may have grounds for initiating a grievance. Read [Policy 70 - Student Petitions and Grievances](#), Section 4. When in doubt, please be certain to contact the department’s administrative assistant who will provide further assistance.

**Appeals:** A decision made or penalty imposed under Policy 70 - Student Petitions and Grievances (other than a petition) or Policy 71 - Student Discipline may be appealed if there is a ground. A student who believes he/she has a ground for an appeal should refer to [Policy 72 - Student Appeals](#).

## Accommodation for Students with Disabilities:

**A note for students with disabilities:** The [AccessAbility Services](#) office, located on the first floor of the Needles Hall extension (1401), collaborates with all academic departments to arrange appropriate accommodations for students with disabilities without compromising the academic integrity of the curriculum. If you require academic accommodations to lessen the impact of your disability, please register with the AS office at the beginning of each academic term.

## Mental Health Support:

All of us need a support system. The faculty and staff at Conrad Grebel University College encourage students to seek out mental health supports if they are needed.

## Mental Health Support, continued:

### On Campus:

- Counselling Services: [counselling.services@uwaterloo.ca](mailto:counselling.services@uwaterloo.ca) / 519-888-4567 Ext. 32655
- [MATES](#): one-to-one peer support program offered by Federation of Students (FEDS) and Counselling Services
- Health Services Emergency service: located across the creek from Student Life Centre

### Off campus, 24/7:

- [Good2Talk](#): Free confidential help line for post-secondary students. Phone: 1-866-925-5454
- Grand River Hospital: Emergency care for mental health crisis. Phone: 519-749-433 ext. 6880
- [Here 24/7](#): Mental Health and Crisis Service Team. Phone: 1-844-437-3247
- [OK2BME](#): set of support services for lesbian, gay, bisexual, transgender or questioning teens in Waterloo. Phone: 519-884-0000 extension 213

Full details can be found online at the Faculty of ARTS [website](#)

Download [UWaterloo and regional mental health resources \(PDF\)](#)

Download the [WatSafe app](#) to your phone to quickly access mental health support information

## Course Schedule:

The following schedule will be revised on an ongoing basis to reflect changes in reading assignments and refinements to the course schedule. All changes will be announced in advance in class and updated on Waterloo LEARN.

Week	Date	Topic	Reading Assignment	Additional Notes
1	Sep. 12	Course introduction: Why peace is everybody's business	N/a	Guests: Sarah Steiner, Jared Baribeau; In-class assignment #1 due
2	Sep. 19	Why has war been the business of so many engineers?	1. Blank, "Hidden in Plain Sight: The Secret History of Silicon Valley" 2. Nieuwsma and Blue, "Engineering and War"	Guest: Melanie Baker; In-class assignment #2 due
3	Sep. 26	Peace movements as a response to changes in the technology of warfare	1. Gillis, <i>Disarmament: A Basic Guide</i> (chapters 3-11)	Guest: Pat Martinson; In-class assignment #3 due
4	Oct. 3	Technological frontiers for peace activists	1. Singer, "Introduction: Scenes from a Robot War" 2. Future of Life Institute, "Autonomous Weapons"	Guest: Branka Marijan; In-class assignment #4 due
5	Oct. 12	Reconsidering the engineering worldview, continued	1. Douglas, "Technical sweetness in Frankenstein and at Los Alamos" 2. Koen, "Engineering Method" 3. Petroski, "The Value of Failure"	Guest: Erica Lee Garcia; In-class assignment #5 due
6	Oct. 17	Reconsidering the engineering worldview	1. Berrett, "Does Engineering Education Breed Terrorists?" 2. Gambetta and Hertog, "Uncivil Engineers"	Guest: Michael Opondo; In-class assignment #6 due
7	Oct. 24	Revisiting engineering design	1. Communitech and the Rideau Hall Foundation, "Tech for Good" 2. Hartley, "The Fuzzie and the Techie" 3. Institute for the Future and Omidyar Network, "Ethical OS"	Guest: Dave Englis; In-class assignment #7 due
8	Oct. 31	Peacebuilding for people who aren't peacebuilding professionals	1. Docherty and Lantz-Simmons, "What is Old is New Again"	Guest: Rachel Reist; In-class assignment #8 due

## Course Schedule, continued:

Week	Date	Topic	Reading Assignment	Additional Notes
9	Nov. 7	The technological underpinnings of positive peace	1. Meier, "The Rise of Digital Humanitarians" 2. United Nations, "Sustainable Development Goals"	Guests: Bruce Taylor; In-class assignment #9 due
10	Nov. 14	PeaceTech	1. Centre for Security Governance, "PeaceTech: Harnessing Technology to Advance Peacebuilding"	Guest: Nigel Moore; In-class assignment #10 due
11	Nov. 21	Conflict on the project team	1. Efti, "Conflict resolution 101 for startups"	Guest: Crista Renner; In-class assignment #11 due
12	Nov. 28	Engineers as social innovators	1. National Academy of Engineering, "Grand Challenges for Engineering" 2. Riley, "We've Been Framed!"	Guest: Nada Basir; In-class assignment #12 due; Take home Final Exam distributed
	Dec. 14			Final Exam due via LEARN Dropbox

## Required Reading Bibliography:

- Berrett, Dan. "Does Engineering Education Breed Terrorists?" *The Chronicle of Higher Education* (23 March 2016). <http://chronicle.com/article/Does-Engineering-Education/235800>
- Blank, Steve. "Hidden in Plain Sight: The Secret History of Silicon Valley." 2008. Video and master slide set available at: <https://steveblank.com/secret-history/>
- Centre for Security Governance. "PeaceTech: Harnessing Technology to Advance Peacebuilding" [E-seminar]. 1 February 2017. <http://secgovcentre.org/csg-research-projects/contemporary-debates/peacetech/>
- Communitech and the Rideau Hall Foundation. "Tech for Good: A Declaration by the Canadian Tech Community" (May 2018). <https://canadianinnovationspace.ca/tech-for-good/>
- Docherty, Jane, and Mikhala Lantz-Simmons. "What is Old is New Again." Journal 1 in *A Genealogy of Ideas*. Centre for Justice and Peacebuilding, 2016. [https://emu.edu/cms-links/cjp/docs/A\\_Genealogy\\_of\\_Ideas\\_-\\_Journal\\_1- May\\_13\\_2016.pdf](https://emu.edu/cms-links/cjp/docs/A_Genealogy_of_Ideas_-_Journal_1- May_13_2016.pdf)
- Douglas, Heather E. "The Bitter Aftertaste of Technical Sweetness." In *Frankenstein: Annotated for Scientists, Engineers, and Creators of All Kinds*, by Mary Shelley, edited by David H. Guston, Ed Finn, and Jason Scott Robert. Cambridge: The MIT Press, 2017. Available on LEARN.
- Efti, Steli. "Conflict resolution 101 for startups." Close.io Blog (n.d.). <http://blog.close.io/conflict-resolution-101-for-startups>
- Future of Life Institute. "Autonomous Weapons: an Open Letter from AI & Robotics Researchers." 28 July 2015. [http://futureoflife.org/AI/open\\_letter\\_autonomous\\_weapons](http://futureoflife.org/AI/open_letter_autonomous_weapons)
- Gambetta, Diego, and Steffen Hertog. "Uncivil Engineers: The Surprising Link Between Education and Jihad." *Foreign Affairs* (10 March 2016). <https://www.foreignaffairs.com/articles/2016-03-10/uncivil-engineers>
- Gillis, Melissa. *Disarmament: A Basic Guide*, 3<sup>rd</sup> ed. United Nations Office for Disarmament Affairs, 2012. Available on LEARN.

## Required Reading Bibliography, continued:

- Hartley, Scott. "The Fuzzie and the Techie: Why the Liberal Arts Will Rule the Digital World." *Stanford Social Innovation Review* (25 April 2017).  
[https://ssir.org/book\\_reviews/entry/the\\_fuzzy\\_and\\_the\\_techie\\_why\\_the\\_liberal\\_arts\\_will\\_rule\\_the\\_digital\\_world](https://ssir.org/book_reviews/entry/the_fuzzy_and_the_techie_why_the_liberal_arts_will_rule_the_digital_world)
- Institute for the Future and Omidyar Network. "Ethical OS: A Guide to Anticipating the Future Impact of Today's Technology" (August 2018). <https://ethicalos.org/>
- Koen, Billy Vaughn. "Engineering Method," in *Encyclopedia of Science, Technology, and Ethics*, ed. Carl Mitcham. Detroit: Macmillan Reference USA/Thomson Gale, 2005. Pp. 635-637. Available on LEARN.
- Meier, Patrick. "The Rise of Digital Humanitarians," ch.1 in *Digital Humanitarians: How Big Data Is Changing the Face of Humanitarian Response*. Boca Raton, FL: CRC Press, 2015. Available on LEARN and as an electronic resource through the UWaterloo Library.
- National Academy of Engineering. "Grand Challenges for Engineering."  
<http://www.engineeringchallenges.org/>
- Nieusma, Dean, and Ethan Blue. "Engineering and War." *International Journal of Engineering, Social Justice, and Peace* 1/1 (Spring 2012): 50-62.  
<https://ojs.library.queensu.ca/index.php/IJESJP/article/view/3519>
- Petroski, Henry. "The Value of Failure." *Duke Divinity School Faith & Leadership Blog* (16 May 2011).  
<https://www.faithandleadership.com/henry-petroski-value-failure>
- Riley, Donna. "We've Been Framed! Ends, Means, and the Ethics of the Grand(iose) Challenges." *International Journal of Engineering, Social Justice, and Peace* 1/2 (Fall 2012): 123-26.  
<https://ojs.library.queensu.ca/index.php/IJESJP/article/view/4307>
- Singer, P. W. "Introduction: Scenes from a Robot War." In *Wired for War: The Robotics Revolution and Conflict in the 21<sup>st</sup> Century*. Penguin, 2011. Available on LEARN.
- United Nations. "Sustainable Development Goals." 2015. <https://sustainabledevelopment.un.org/sdgs>

## Extended Reading Bibliography:

- Bucciarelli, Louis. *Designing Engineers*. Cambridge, MA: The MIT Press, 1994.
- Ferguson, Eugene S. *Engineering and the Mind's Eye*. Cambridge, MA: The MIT Press, 1992.
- Florman, Samuel C. *Existential Pleasures of Engineering*, 2nd edition. New York: St. Martin's Griffin, 1996.
- Gambetta, Diego, and Steffen Hertog. *Engineers of Jihad: The Curious Connection Between Violent Extremism and Education*. Princeton: Princeton University Press, 2016.
- Hartley, Scott. *The Fuzzy and the Techie: Why the Liberal Arts Will Rule the Digital World*. New York: Houghton Mifflin Harcourt, 2017.
- Kallenberg, Brad. *By Design: Theology, Technology and the Practice of Engineering*. Eugene, OR: Cascade Books, 2013.
- Koen, Billy Vaughn. *Discussion of the Method: Conducting the Engineer's Approach to Problem Solving*. New York: Oxford University Press, 2003.
- Meier, Patrick. *Digital Humanitarians: How Big Data Is Changing the Face of Humanitarian Response*. Boca Raton, FL: CRC Press, 2015.
- Patrikarakos, David. *War in 140 Characters: How Social Media is Reshaping Conflict in the 21<sup>st</sup> Century*. New York: Basic Books, 2017.
- Petroski, Henry. *To Forgive Design: Understanding Failure*. Cambridge, MA: Belknap Press, 2012.
- Singer, Peter W. *Wired for War: The Robotics Revolution and 21<sup>st</sup> Century Conflict*. New York: Penguin, 2009.
- Vincenti, Walter. *What Engineers Know and How They Know It*. Baltimore: Johns Hopkins University Press, 1990.