

W8EDU: The Case Amateur Radio Club

Kristina Collins, KD80XT

Case Western Reserve University

PRESENTED AT:



10 YEARS OF PROGRESS

In 2010, the Case Amateur Radio Club was a largely alumni-based club with a small student membership. Ten years later, the club enjoys a large and active membership, plays a role in engineering curriculum at CWRU, and supports NSF-funded research.



The key to our success is a faculty-supported strategy of club involvement, curricular integration, and research projects undertaken through senior project courses. These levels of involvement build on one another, generating a varied and enthusiastic student membership.



This poster should be considered a recipe for college clubs seeking to increase membership and involvement.

GETTING STARTED

Equipment

To have a ham radio club, one must first have ham radios. W8EDU is one of the oldest student organizations at CWRU, (<https://w8edu.wordpress.com/our-history/>) and we're fortunate to have an excellent club station to work out of. Whether you're starting from scratch or renewing an existing club station, you can seek equipment funding from your undergraduate student government, donations and grants from the ham community.



License Exams

It's crucial to have license exams available, and encourage students to take them. W8EDU has held exams with the ARRL, Laurel and W5YI VECs. We keep our current exam information (<https://w8edu.wordpress.com/license-exams/>) on our website so questions can be quickly and easily answered. One benefit of the recent rise in virtual conferencing is that exams can now be easily taken online (<https://hamstudy.org/sessions>), so aspiring and renewing ham clubs do not necessarily have to maintain a VE team of their own.

It's possible to introduce aspiring hams to the rudiments of radio before they complete the license exam: shortwave listening (<https://rx.linkfanel.net>) does not require a license, you can explore digital modes with audio signals (<https://w8edu.wordpress.com/2018/03/29/exploring-bit-error-rate-with-fldigi/>), and contests can be simulated using unlicensed walkie-talkies. For some students, these exercises are helpful to motivate getting a license. For others, it may be easier to complete the licensing process first.

Elmership

It's important to a college club's long-term success to have a dedicated faculty advisor. David AD8Y has advised W8EDU since 2015.

CURRICULUM

Integrating amateur radio into undergraduate curriculum is not uncommon (<https://inst.eecs.berkeley.edu/~ee198-13/sp18/>), particularly in engineering curriculum. However, ham radio doesn't have to be limited to technical curriculum. Our first foray into curricular integration was a general education (<https://sages.case.edu/2014/12/05/the-course-sequence/>) class focused on writing, with a cohort of 17 students. We reported the findings from this class in an IEEE conference paper (<https://ieeexplore.ieee.org/document/7910230>). The class was well-received and has been reprised several times since.

USSO 290Y – “Shrinking the World: Ham Radio & Distance Communication” – Spring 2016, Fall 2016, Spring 2017

Radio operators can talk to each other across the world, launch and use space satellite stations, and bounce their voices off the moon. And yet the Federal Communications Commission still regulates what they may say on the air. Why is that? And why does amateur radio require a license? In this course, we'll discuss the history of long-distance communication methods stretching from the British Penny Post into the modern digital age, viewed particularly through the lens of the Amateur Radio Service. We will also explore the ways that advances in communication technology have changed politics, entertainment and personal interactions. Who makes the rules for a new system of communication? What causes changes in those rules? Was Orson Welles morally, ethically, or legally responsible for causing a mass panic with his reading of “War of the Worlds?” What might the future hold for communications? Students will earn amateur radio licenses, make contacts with other radio amateurs around the world and with each other, and possibly bounce signals off the moon and listen for their return. We will also look at the ham radio culture, from QSL cards to public service and contesting. Students will learn some basic hands-on electronics, but no previous technical background is required.



Since this class began, we have also integrated ham radio into several classes in the electrical engineering curriculum. Students from one ham-connected class often enroll in others, forming an informal course sequence. Anecdotally, we can attest that these courses have motivated students to pursue communications and RF studies at the graduate level. Ham-connected classes also increase club membership, since they help students complete the licensing process and show how radio is applicable in the curriculum.



EECS 397/600 – “Introduction to RADAR” – Spring 2017

Basic aspects of history of radar and of modern radar systems, with laboratory work. Topics will include radar cross section, noise, modulation, the radar range equation, waveform design, pulse compression, detection, antennas, propagation, synthetic aperture radar, and miscellaneous general topics. Comparisons with acoustic ranging SONAR will be made. Laboratory exercises will include passive radar demonstration using amateur radio equipment, acoustic ranging, and small-team construction of synthetic aperture radar system capable of sensing range, doppler, and synthetic aperture radar imaging.

EECS 351, “Communications and Signal Analysis” - Spring 2018 - Fourier transform analysis and sampling of signals. AM, FM and SSB modulation and other modulation methods such as pulse code, delta, pulse position, PSK and FSK. Detection, multiplexing, performance evaluation in terms of signal-to-noise ratio and bandwidth requirements.

ECSE 309, “Electromagnetic Fields” - Spring 2019, 2020 - Maxwell's integral and differential equations, boundary conditions, constitutive relations, energy conservation and Poynting vector [sic], wave equation, plane waves, propagating waves and transmission lines, characteristic impedance, reflection coefficient and standing*

wave ratio, in-depth analysis of coaxial and strip lines, electro- and magneto-quasistatics, simple boundary value problems, correspondence between fields and circuit concepts, energy and forces. Prereq: PHYS 122 or PHYS 124. Prereq or Coreq: MATH 224. Some background expected: Circuits ENGR 210

CLUB ACTIVITIES

Operating Hours

We hold weekly open hours in the radio shack and invite members of the campus community to join us. This is essential for building a sense of community in the club, and for ensuring that club business is conducted in a timely fashion. We keep inexpensive soldering kits (<https://www.amazon.com/Velleman-MK147-Dual-White-Stroboscope/dp/B000TA7AMW>) on hand as an approachable activity for newcomers.

Contesting

We organize an active club presence for the ARRL School Club Roundup (<http://www.arrl.org/school-club-roundup>), and occasionally participate in other contests.

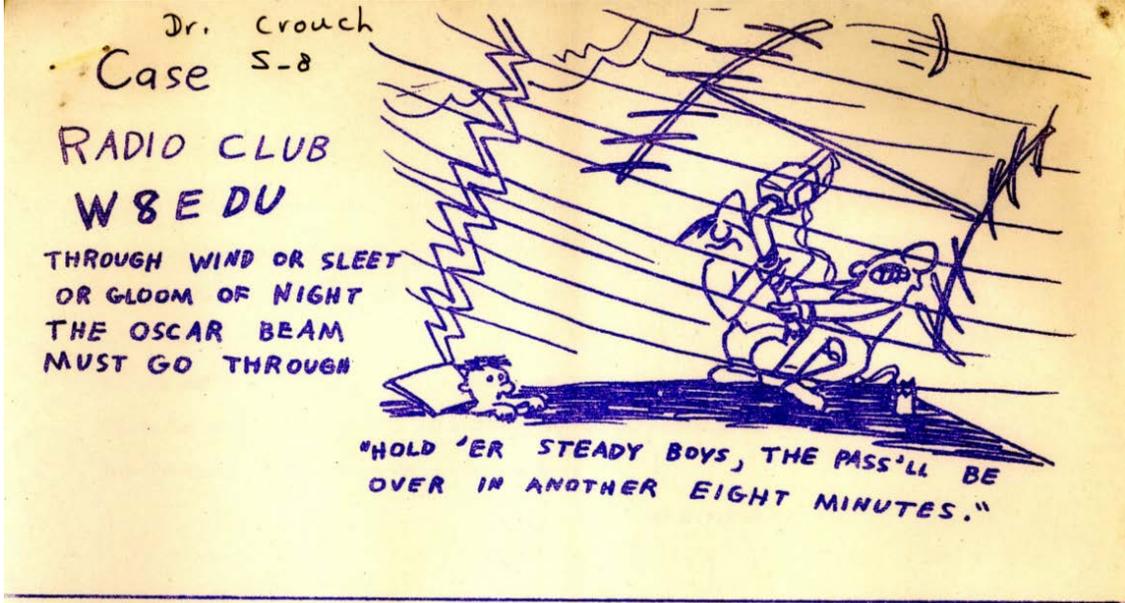
Field Day

We hold a large Field Day (<https://w8edu.wordpress.com/fieldday/>) gathering each year, with an emphasis on including as many members of the community as possible.

RESEARCH & STUDENT PROJECTS

In addition to the curricular integration described above, W8EDU supports a large number of senior projects (<https://w8edu.wordpress.com/2019/03/30/ham-radio-senior-projects-spring-2019/>) in engineering. In addition to the educational benefit for students, senior projects can improve shack infrastructure over the long term. Large scale projects (like building and installing an EME antenna (<https://w8edu.wordpress.com/2018/07/25/new-eme-antenna-installation-raise-high-the-2-meter-beam-engineer/>)) can stretch over multiple semesters, with one senior project team documenting their work and handing the project over to the next. Two senior projects are presented in other poster sessions at this conference: a Radio JOVE installation and analysis of the 2020 solar eclipses. W8EDU is also at the core of CWRU's participation in the Personal Space Weather Station project.









LONG TERM PLANNING

Fundraising is a necessity for college clubs in order to afford equipment and maintenance. Your club can raise funds through swapfests (<http://w1mx.mit.edu/flea-at-mit/>) and other events. Building strong relationships with alumni and hams in your community will also help your club attract expertise and donations. Maintain a station logbook and keep in touch with your club's alumni.

Work with your university's development team or alumni association to create a giving link (<http://https://www.casealum.org/giving/radio-club>) so donors can easily contribute. At W8EDU, we're currently working on starting an endowment to support our club in the future.

Be prepared to receive donations of any amount. We recommend having your priority list evenly spaced on a logarithmic scale: what will your club do if someone donates \$100? \$1000? \$10,000? More? — Try discussing this with your club members as a thought experiment. It will help clarify priorities and encourage you to think big.