

HOPPER HALL



Welcome to HOPPER HALL

THE NAVAL ACADEMY CENTER FOR CYBER SECURITY STUDIES

The building is named for Rear Adm. Grace Hopper, an accomplished mathematician who joined the U.S. Navy Reserve during World War II. She later worked on a team to develop the UNIVAC computer and convert mathematic code into language, developing the first compiler in 1952 which led to the creation of COBOL. Hopper served as the director of the Navy Programming Languages Group in the Navy's Office of Information Systems Planning and developed validation software for COBOL and its compiler as part of a COBOL standardization program for the Navy. Hopper retired from the Navy in 1986 as a rear admiral.

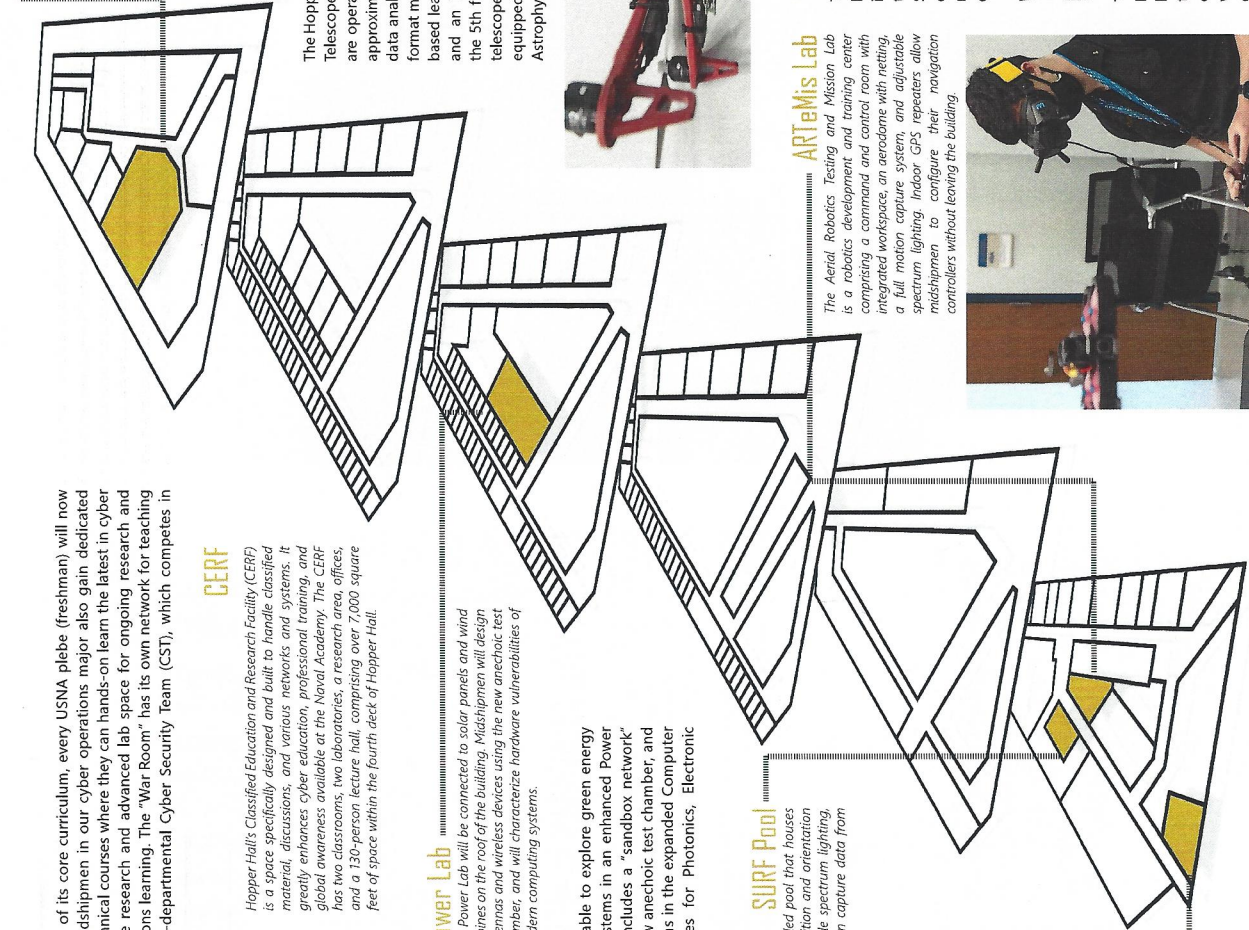
In her legacy, the Hopper Hall building will be home to midshipmen in the Cyber Operations; Computer Engineering; Computer Sciences; Electrical Engineering; Information Technology; and Robotics and Control Engineering majors, as well as to laboratories for Naval Architecture and Ocean Engineering and Physics majors.

QUICK FACTS

- Classes officially began in-person September 2020.
- USNA was the first institution of higher learning in the U.S. to require cyber security classes for all students.
- Construction began October 2016, and was completed July 2020.
- This is the Naval Academy's first new academic building on the Yard since 1975.
- This will be the first building at any of one of the three major service academies (USNA, USAFA, USMA) to be named after a woman.
- The Naval Academy Foundation has raised over \$45 million in philanthropic support for the outfitting of Hopper Hall and support of cyber and cyber-related disciplines at the Academy.

"These facilities are critical to the success of our Cyber Studies curriculum and our ability to commission officers fluent in cyber operations for the Fleet."

Vice Adm. Sean Buck
Naval Academy Superintendent



CYBER SCIENCE

As the first institution of higher learning to require cyber security as part of its core curriculum, every USNA plebe (freshman) will now utilize classrooms with state-of-the-art technology for cyber courses. Midshipmen in our cyber operations major also gain dedicated space for their capstone research and now have two advanced labs for technical courses where they can hands-on learn the latest in cyber operations. Likewise, midshipmen and faculty gain previously unavailable research and advanced lab space for ongoing research and scholarship efforts across various fields in cyber science and cyber operations learning. The "War Room" has its own network for teaching and conducting full-spectrum cyber operations, and hosts USNA's cross-departmental Cyber Security Team (CST), which competes in various cyber competitions.

COMPUTER SCIENCE

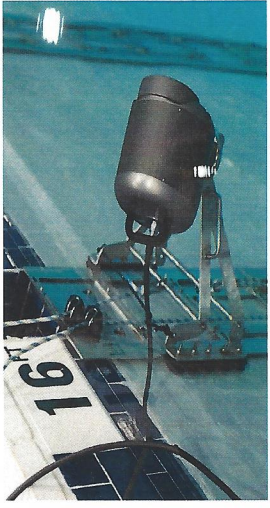
The Computer Science Department operates newly equipped Linux computer labs in Hopper Hall dedicated to the study of computer networks, using physical routers and switches, and to the study of Intelligent Robotics, with programmable TurtleBots. The department also uses Raspberry Pi miniature computers for hands-on labs in several courses. The academic spaces in Hopper Hall are connected by fiber networks for very low latency and high bandwidth support to all the classrooms and labs.

ELECTRICAL AND COMPUTER ENGINEERING

Students in the Electrical and Computer Engineering Department will be able to explore green energy systems, microgrid technology and the cyber vulnerabilities of power systems in an enhanced Power Lab that connects to solar panels and wind turbines on the roof, and includes a "sandbox network" testbed. Students will design antennas and wireless devices using our new anechoic test chamber, and will characterize the hardware vulnerabilities of modern computing systems in the expanded Computer Engineering and Advanced Networking laboratories. Laboratory spaces for Photonics, Electronic Materials, and Data Science were also expanded within Hopper Hall.

SURF Pool

The Surface and Underwater Robotics Facility is a 36' x 43' x 16' temperature-controlled pool that houses a twin in-air and underwater motion capture system capable of tracking the 3D position and orientation of objects above, on the surface, and underwater. It also includes a crane, controllable spectrum lighting, a motorized catwalk, and wireless capabilities to allow multiple users to access motion capture data from anywhere in the facility.



Gamma Lab

The Gamma Lab is a flexible makerspace equipped with a variety of rapid prototyping tools such as 3D printers, laser cutters, and vacuum forming machines. From custom primer circuit boards to advanced graphics and even 3D scanned models, this lab provides the hardware and software capabilities needed to generate a wide array of advanced prototypes and functional products.

CERF

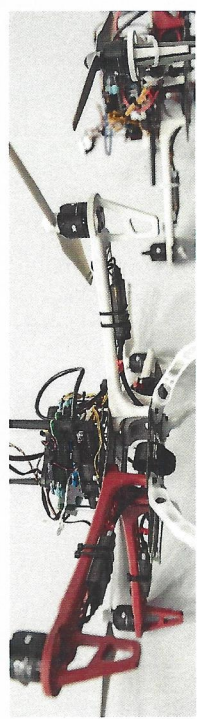
Hopper Halls Classified Education and Research Facility (CERF) is a space specifically designed and built to handle classified material, discussions, and various networks and systems. It greatly enhances cyber education, professional training, and global awareness available at the Naval Academy. The CERF has two classrooms, two laboratories, a research area, offices, and a 130-person lecture hall, comprising over 7,000 square feet of space within the fourth deck of Hopper Hall.

Power Lab

The Power Lab will be connected to solar panels and wind turbines on the roof of the building. Midshipmen will design antennas and wireless devices using the new anechoic test chamber, and will characterize hardware vulnerabilities of modern computing systems.

PHYSICS

The Hopper Hall Observational Astrophysics Facility features a 20-inch PlaneWave Optical Telescope and a 3.0m SPIDER 300A Radio Telescope on the building's roof, both of which are operated from the control room on the 5th floor. The control room has space for approximately 15 students and a professor to operate the telescopes and participate in data analysis simultaneously, with the option to display images and results on a large-format monitor in the front of the room. The astrophysics facility also features a project-based learning space for students in the major, equipped with data analysis computers and an instrumentation workbench. Six specially-designed telescope pedestals on the 5th floor terrace allow for rapid deployment and alignment of six 8-inch portable telescopes to be used in laboratory classes and on viewing nights. The facility is also equipped with permanent office space for early-career scientists who support the USNA Astrophysics program via funding from the National Science Foundation and NASA.



NAVAL ARCHITECTURE & OCEAN ENGINEERING

The USNA Naval Architecture & Ocean Engineering (NAOE) Department and Hydromechanics Laboratory (NAHL) new waterfront spaces in Hopper Hall include two new project-based learning rooms and a large laboratory space, the Waterfront Activities Lab (WAL). The WAL provides direct access to WRC's SURF and two (outdoor) finger piers on College Creek, and offers a perfect environment for midshipmen to perform cutting-edge naval architecture/marine engineering and ocean engineering research, including multidisciplinary research related to unmanned maritime systems (UMS).

WEAPONS, ROBOTICS, AND CONTROL ENGINEERING

The new facilities include state-of-the-art robotics classrooms, the Gamma Lab, the SURF Pool, and the ARTEMIS Lab which will provide midshipmen with knowledge, experience, and insight into movement of autonomous systems as they learn the art and science of controlling engineering systems. The robotics classrooms include a motion capture system, 10 new Universal Robot UR3e with six degrees of freedom robotic manipulators, and 10 new CUDA-enabled, dual-monitor workstations for next-generation labs involving motion planning, machine vision, and deep learning.

ARTEMIS Lab

The Aerial Robotics Testing and Mission Lab is a robotics development and training center comprising a command and control room with integrated workspace, an aerodome with netting, a full motion capture system, and adjustable spectrum lighting. Inboard GPS repeaters allow midshipmen to configure their navigation controllers without leaving the building.

