## QUICK FACTS & ADMINISTRATION

### WHO IS THE PROGRAM FOR?

- Students interested advancing their careers in the fields of unmanned vehicles (UxVs), robotics, and autonomous systems will be well suited for this certificate program.
- Resident and non-resident U.S. military officers, U.S. government civilians, and DoD contractors.

### QUALIFICATIONS

- Baccalaureate degree in engineering or closely related field.
- Experience with computer programming.
- Command/company endorsement.

### PROGRAM LENGTH & COMMITMENT

- Four quarters, **online**.
- Begins biannually in the Summer and Winter quarters.
- Students participating in academic programs at the Naval Postgraduate School (NPS) may incur service and/or employment obligations.

### HOW TO APPLY

Applications are handled through the Office of Admissions at NPS.

www.nps.edu/web/admissions/apply1



## CONTACT INFORMATION

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Department of Mechanical and
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**www.nps.edu/web/mae/robotics**

More information on NPS Distance Learning
(DL) programs
**www.nps.edu/dl**



*Brochure developed by*
Naval Postgraduate School

**Graduate Education
Advancement Center (GEAC)**

*411 Dyer Rd., Knox 120, Monterey, CA 93943*



Department of Mechanical and
Aerospace Engineering

## GRADUATE CERTIFICATE
### in
# ROBOTICS ENGINEERING

*REAL-TIME AND FLEXIBLE-TIME
DISTANCE LEARNING PROGRAM*

*Advance your skills in one
of the fastest trending,
in-demand, and defense
relevant technology sectors.*

NPS
PRAESTANTIA PER SCIENTIAM

NAVAL POSTGRADUATE SCHOOL

## PROGRAM OVERVIEW

The Naval Postgraduate School (NPS) offers the **Graduate Certificate Program in Robotics Engineering**. This highly-relevant, four-course online program helps DoD professionals advance their careers and become leaders in the emerging fields of unmanned vehicles (UxVs), robotics, and autonomous systems.

*"Advances in A.I., autonomous control systems, advanced computing, big data, learning machines... ...are leading us toward great human-machine collaboration."*

*Bob Work*
*Former Deputy Sec. of Defense*

*MQ-8B Fire Scout, UAV*

# CURRICULUM: 4 COURSES

## Foundations

*1st Quarter*

### ME3420 Computational Foundations of Robotics (3-2)

This course prepares students for future engineering coursework at NPS. If offers a hands-on introduction to foundational computational concepts and development practices employed in the engineering of robotics and autonomous systems. Topics include both general purpose programming and intermediate techniques specific to robotics, e.g., component-based development, event-based programming, cyber-physical interface, and real-time execution.

*2nd Quarter*

### EC4310 Fundamentals of Robotics (3-2)

This course presents the fundamental engineering and programming concepts required in the development and deployment of land-based robotic systems. Main topics include kinematics, dynamics, manipulability, motion/force control, controller architecture, motion planning, navigation, and sensor integration. Real and simulated mobile robots will be used for class projects. Military applications of robotic systems will be discussed.
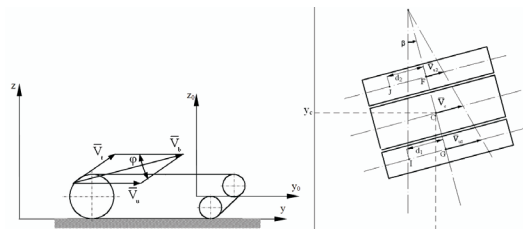


## Applications

*3rd Quarter*

### ME4828 Fundamental GNC Algorithms of Autonomous Robotics (3-2)

This course presents key fundamental concepts of the Guidance, Navigation, and Control (GNC) of modern autonomous vehicles and builds their most common algorithms with a particular focus on military applications. The course defines the objectives of each GNC component and the combined closed-loop system. It transitions the GNC theory onboard a robot by utilizing modern concepts of concurrency, vectorization, and interprocess communication. The classwork utilizes Python/MATLAB languages to teach object-oriented approach, multithreading, event-based programming, real-time execution, etc.

*4th Quarter*

### ME4800 Machine Learning for Autonomous Operations (3-2)

This course focuses on theory and applications of three branches of machine learning: supervised, unsupervised, and reinforcement learning for mechanical engineering and robotics applications. Material is covered via lectures, hands on coding, and take-home assignments. Students will gain an understanding of when and how to apply each machine learning technique. Typical assignments include machine learning applications for engineering simulations and experiments, noisy sensor readings, ground and air vehicle control, anomaly detection, control allocation, and/or cyber-physical monitoring.
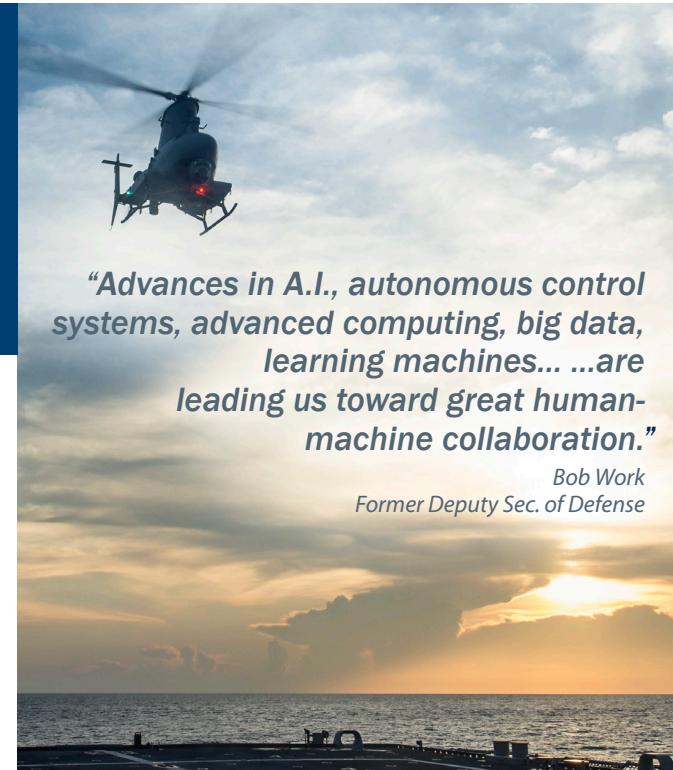
# OUTCOMES / CAREER ADVANCEMENT

**The Robotics Engineering graduate certificate provides:**

- Technical concepts and skills necessary to understand, design, and operate robotic systems.

- Faculty-led instruction plus hands-on (lab and collaborative) activities.

- Flexible and self-paced learning experiences.

- Challenging opportunities to apply knowledge to defense-related problems and contexts.

- Career advancement and an added credential for practicing engineers.

*For civilian and active-duty service members.*