Autonomous

**RACECAR Grand Prix**
Program the artificial intelligence for a self-driving 1/10th scale car and race it against other teams in an autonomous Mini Grand Prix.

**Explore. Learn. Race!**

**Autonomous Drone Racing**
Take autonomy airborne using onboard sensors to process visual cues from the world around our drones. You’ll program the drone to detect and avoid obstacles as well as read QR codes. Your team’s code will guide the UAV through a challenging environment – where each team will have the opportunity to show off what they’ve learned.

**E-Textile**
Wearable Technology
Learn about textile and apparel manufacturing and electronic prototyping while creating your own piece of wearable technology.

**Underwater Autonomous Vehicle Challenge**
Learn the challenges faced by real-world ocean engineers in designing, building and programming autonomous underwater vehicles (AUVs). The council will autonomously navigate an underwater obstacle course, applying real-time decision making based on feedback from onboard sensors.

**Autonomous Cognitive Assistant**
CogWorks uses project-based learning to immerse students in exciting applications of modern machine learning and data science. The central ethos of this course is that impressive projects can be completed without depending on "mystery boxes". All lectures are paired with detailed Python-based exercises that incorporate both applied mathematics and basic algorithms. Student teams complete capstone projects they help select, using tools like git and VSCode to collaborate together.

**Quantum Software**
BWSI and MITRE are preparing the next generation of scientists and engineers to take advantage of the opportunities that the quantum revolution will bring. The course starts with the fundamentals of quantum information, takes students through the concepts underlying quantum computation with hands-on coding exercises, and concludes with the challenge of implementing a quantum algorithm as a software program so it can be tested, analyzed, and run.

**Embedded Security and Hardware Hacking**
This course by MITRE aims to start the education of the next generation of security engineers — teaching fundamental computer engineering in addition to cryptography, cybersecurity, and system security. Topics covered include microcontrollers and device architecture, low-level programming, protocol design, cryptography, software security, and hardware security. A hands-on approach gets students working with hardware during lab exercises. Students will also work in teams to design and build a secure system in an attack and defense style exercise, targeting other team’s designs once theirs is completed.

**Serious Game Design and Development with AI**
SGAI introduces students to game design and artificial intelligence programming their own modifications to a game. Known as “Serious Games” this provides a way to better understand various real-world situations such as disease spread, self-driving cars and more. Artificial intelligence is used to investigate how a computer will handle the moral dilemmas that will happen and compare to human decisions in the complex environments modeled.

**Robertson Air System Synthetic Aperture Radar**
Don’t just fly a drone – turn it into a high-tech sensor! Experience complex systems engineering in a new way. Students will build a fully functioning radar imaging system including everything from drones and RF hardware to data processing. At the end of this course, students will have built a complex system to be proud of and gained first-hand experience in the world of engineering.

**Microelectronics and Hardware Development**
This course for 2024 will introduce students to the fundamentals of hardware system design and show how hardware developers approach problems and think like engineers. Students with no prior experience in hardware are encouraged to participate.

**Basics of ASIC**
BWSI and MITRE will offer this course on open source semiconductor design and fabrication of Application Specific Integrated Circuits (ASICs). This course will give students a fundamental and working knowledge of the building blocks of today’s electronic world — knowledge that will benefit the student no matter what they decide to pursue academically. Students will receive hands-on experience on how to design and arrange semiconductors on a nanometer scale to perform a specific function.

**Students are eligible for the 2024 summer program if:**

- They are attending high school in US or US citizen abroad
- They have demonstrated technical ability (evidenced by recommendations from school officials, test scores, coursework, grades, and extracurricular activities)
- They have completed the lessons in the online tutorial for their desired project
- Online tutorials start February 2024 (prerequisite in order to apply to the July program)
- BWSI runs July 8 – August 4 2024

To get more information and to apply, visit: https://beaverworks.ll.mit.edu/CMS/bw/BWSI or email: bwsi-admin@mit.edu