Winter 2021
Updated October 22, 2020

AERO 470 Control of Aerospace Vehicles [Bernstein]
AEROSP 548 [Kolmanovsky] Astrodynamics – TTh 8:30-10:00
AERO 550 (EECS 560) (ME 564) (CEE 571) Linear System Theory [Ozay] - MWF 9:30-10:30
AERO 551 (EECS 562) Nonlinear Systems and Control [Meerkov] – MW 1:30-3:00
AERO 552 Aerospace Information Systems [Jeannin] – MW 10:30-12:00
AERO 580 (EECS 565) Linear Feedback Control [Seiler] - TTh 10:30-12:00
AERO 740 Visual Navigation for Autonomous Aerial Vehicles (VNA^2V) [Tzoumas] – MWF 1:00-2:00

EECS 419 Electric Machines and Drives [Hofmann] – TTh 3:00-4:30
EECS 460 Control Systems Analysis and Design [Meerkov] – MW 10:30-12:00
EECS 461 Embedded Control [Cook] – TTh 9:00-10:30
EECS 467 Autonomous Robotics [Jenkins] – MW 9:00-10:30
EECS 534 Analysis of Electric Power Distribution Systems and Loads [Hiskens]
EECS 560 (AERO 550) (ME 564) (CEE 571) Linear System Theory [Ozay] – MWF 9:30-10:30
EECS 561 (ME 561) Design of Digital Control systems [Vasudevan] – TTh 3:00-4:30
EECS 562 (AERO 551) Nonlinear Systems and Control [Meerkov] - TTh 1:30-3:00
EECS 565 (AERO 580) Linear Feedback Control [Seiler] - TTh 10:30-12:00
EECS 567 (ROB 510) (ME 567): Robot Kinematics and Dynamics [Gregg] – TTh 10:30-12:00
EECS 568 (ROB 530) (NA 568) Mobile Robotics [Ghaffari] – TTh 1:30-3:00
EECS 598-006 Motion Planning [Berenson] – MW 3:00-4:30
EECS 600 Function Space Methods in System Theory [Balzano] – TTh 10:30-12:00

ME 542 (AUTO 542) Vehicle Dynamics and Automation [Orosz] - TTh 2:00-3:30
ME 552 Mechatronic Systems Design [Awtar]
ME 561 (EECS 561) Design of Digital Control systems [Vasudevan] - TTh 3:00-4:30
ME 564 560 (AERO 550) (EECS 560) (CEE 571) Linear System Theory [Ozay] - MWF 9:30-10:30
ME 565 Battery Systems and Control [Siegel] – MW 10:30-12:00
ME 566 Hybrid Electric Vehicles [Peng] – MW 4:00-5:30
ME 567 (ROB 510) (EECS 567): Robot Kinematics and Dynamics [Gregg] – TTh 10:30-12:00
ME 599 (CEE 501) (ROB 599) (ISD 599) Dynamics and Control of Connected Vehicles [Orosz] - TTh 12:00-1:30

NA 568 (ROB 530) (EECS 568) Mobile Robotics [Ghaffari] – TTh 1:30-3:00
NA 599-065 Marine Robotics (Skinner) – MW 1:00-2:30

ROB 510 (ME 567) (EECS 567): Robot Kinematics and Dynamics [Gregg] – TTh 10:30-12:00
ROB 530 (EECS 568) (NA 568) Mobile Robotics [Ghaffari] – TTh 1:30-3:00
ROB 550 Robotics Systems Laboratory [Gaskell]
ROB 599 (CEE 501) (ME 599) (ISD 599) Dynamics and Control of Connected Vehicles [Orosz] - TTh 12:00-1:30

Interesting IOE courses
IOE 510 Linear Programming I [Jiang] – MW 9:00-10:30
IOE 511 Continuous Optimization Methods [Berahas] – TTh 9:00-10:30
IOE 614 Integer Programming [Lee] – MW 12:00-1:30
IOE 691 Approximation Algorithms [Nagarajan] – MW 10:30-12:00

Visual Navigation for Autonomous Aerial Vehicles (VNA_2V) - AEROSP 740

[picture courtesy of NASA, Urban Air Mobility Program]

Course description

Visual Navigation for Autonomous Aerial Vehicles (VNA_2V) covers theoretical foundations of vision-based navigation as well as implementation and testing of algorithms in a photo-realistic Unity-based simulator. Lectures will explore fundamental tools and results from a wide spectrum of disciplines (non-convex and combinatorial optimization, reinforcement learning, geometric control, non-linear estimation, geometry) that underlie modern techniques for real-time control and trajectory optimization, robot perception, and 3D computer vision (including visual-inertial navigation and SLAM), and machine learning. Implementation and testing will be based on C++ and the Robot Operating System (ROS) (introduction to both will be given). Students will be given access to an advanced drone simulator, and will be able to implement and test state-of-the-art algorithms and learn about the cutting edge of autonomous navigation. The final portion of the class includes an individual or team-based project that has the goal of advancing the state-of-the-art in vision-based navigation, according to students' interests.

Syllabus: https://tinyurl.com/VNA2V2021-syllabus

Prerequisites

Basic knowledge real-time embedded programming (EECS 461 or similar), optimal estimation and control (AEROSP 550 or AEROSP 575 or similar), linear algebra (MATH 214 or ROB 501 or similar), or permission of the instructor. Coding assignments are based on ROS and openCV, and are in C++ (we will provide the necessary introduction to C++, ROS, and openCV).

Lecture, Lab, and Office Hours

- Online Lectures:† M/W/F 1-2pm EST (on Zoom)
- Online Labs:† TBD (on Zoom)
- Office Hours: TBD (on Zoom)

†Lecture and Lab Hours will also be made **available offline**, to assist **asynchronous learning**.

Instructor

- Vasileios Tzoumas, Assistant Professor, Aerospace Engineering
  (he/him/his; vtzoumas@umich.edu; https://vasileiostzoumas.com/)