# Guidance, Navigation and Control

Welcome!

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Practicalities of the course
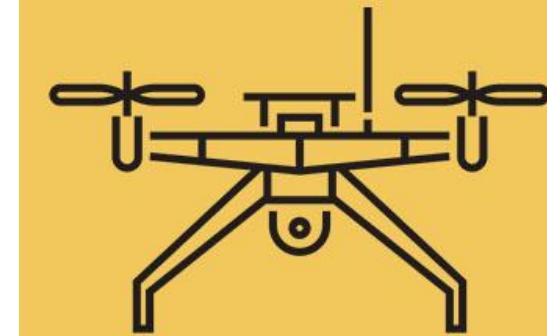
- 9 or 10 lectures

- Oral exam based on project, project report and knowledge on course

- Mini-project (where you push the limits of what you know)

- Slides will be posted on itslearning for each lecture (no additional lecture notes in this course)

- MATLAB/Simulink exercises to try and train on the concepts

- Material added on itslearning

GNC in a few simple questions (from the perspective of the vehicle)

Guidance: Where should I go?

Higher-level function, also related to the notion of "purpose"/mission

Navigation: Where am I?

Estimation function, related to perception, sometimes extended to "how do I feel?"

Control: What should I do?

Typically see as low-level function. Also related to "Who am I?"

SDU

GNC is everywhere

GNC for drones? What drones? ☺

SDU
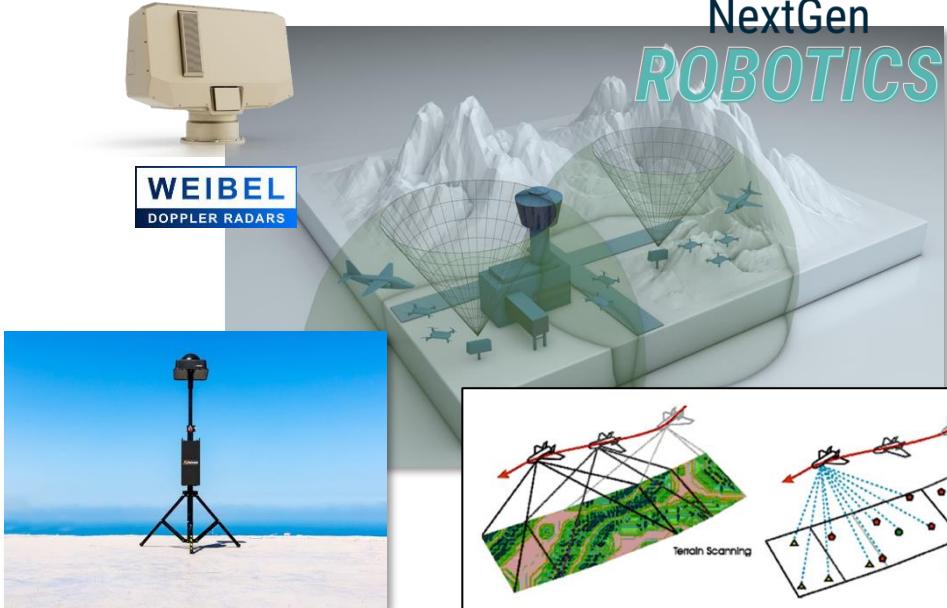
My current projects
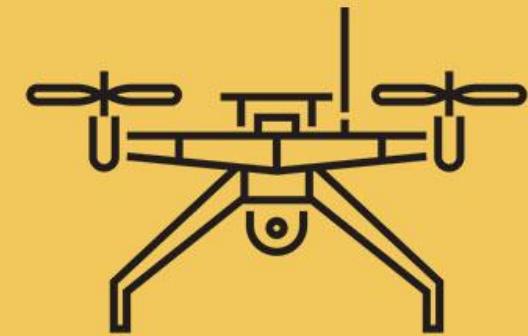
Counter UAS technology

NextGen
ROBOTICS
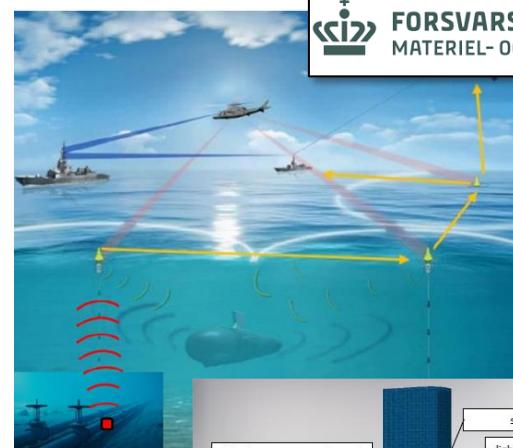
Ocean Eyes

WEIBEL
DOPPLER RADARS
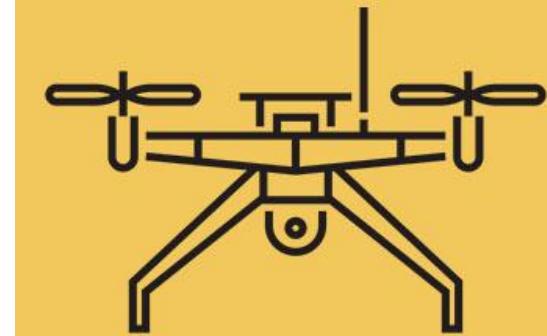
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MATERIEL- OG INDKØBSSTYRELSEN

Terrain Scanning

Known Feature
Identified Feature
Possible Feature

solar cells
lightweight rigid wingsail
Moving mass compartement
Wavepiercing bow
keel

D.R.O.N.E.S.

/nnovationsfonden

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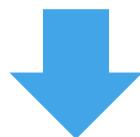
Plan of the course
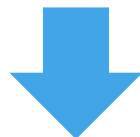
Modelling

⬇

Guidance

⬇

Control

⬇

Navigation

- Kinematics
- Rigid-body dynamics
- Quaternions
- Kinetics
- Waypoints, paths and trajectories
- Guidance laws
- Feedforward control and differential flatness
- Nonlinear control
- Kalman Filtering
- The Unscented Kalman Filter

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