Design challenge 3:

Forklift with manipulator

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Kravspesifikasjoner

Robot design challenge 3: Forklift with manipulator

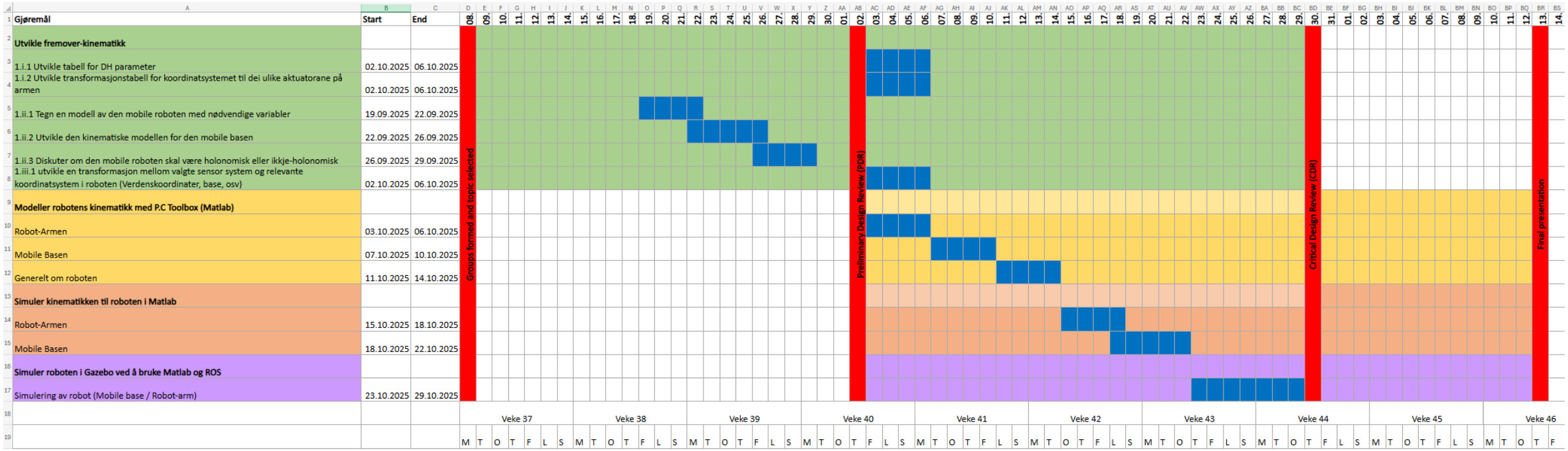
A forklift with a robot arm for lifting goods and pallets.

- Robot arm requirements:
  a) Minimum 3-dof arm for lifting
  b) Additional dof in gripper/fork to position fingers horisontally
  c) Minimum reach with stationary mobile base is 150 cm in the horizontal plane, and 300 cm in the vertical plane
  d) Capable of lifting:
    a) Gripper: 100kg
    b) Payload (picked object): Max. 500kg
- Mobile base requirements:
  a) Capable of navigating autonomously between aisles in a 100 sqm warehouse
  b) Have a turn radius less than 200 cm
  c) Rear wheels are used for steering
- Sensor requirements:
  a) Low-cost 3D camera for manipulation, type RealSense D435 or similar – mounted on mobile base
  b) Localization sensors for autonomous navigation
- Expected results: A forklift capable of picking up a pallet at location A, navigating to location B, and placing the pallet correctly on a storage shelf.

The Mini Excavator from the Toyota Challenge can be used for inspiration.

Design from ELE306 group 5, autumn 2022 (Bunes, Eide, Fimreite, Helland Myhren). For illustration only.

Gantt Diagram



Navigation – Control - Localization

- Navigation Strategy: Lattice Planer
- Control Strategy: Move to pose
- Localization Strategy: SLAM with LiDAR

Kinematics

- $\dot{x} = v\cos\theta$
- $\dot{y} = v\sin\theta$
- $\dot{\theta} = \frac{v}{Rf} = \frac{v}{L}\tan\gamma$