1. Background Info (3 hours)
    a. Statistics
        i. Data Metrics
            1. Mean
            2. STD/variance
            3. Bias
        ii. Distributions
            1. Uniform distribution
            2. Normal/Gauss distribution
            3. White Noise
            4. Pink Noise
    b. Optimization
        i. Regression
        ii. Sum of least squares
        iii. Recursion
        iv. Cost Function/heuristics
        v. Riccati Equation
    c. Linear Algebra
        i. State vectors and equations
        ii. Covariance Matrices
        iii. Matrix inversion and exponentials
2. KF and EKF (4 hours)
    a. Bayes filter
        i. Bayes rule
        ii. Normalization, Conditioning, State estimation
        iii. Recursive Bayesian Updating
        iv. Bayes Filters
    b. Alpha-Beta-Gamma Filter (Optional)
        i. Filter equation
        ii. Relationship to Kalman filter
    c. Kalman Filter
        i. Multivariate Gaussians, Discrete Kalman Filter
        ii. Initialization, Dynamics, Observations
        iii. Kalman Filter: Prediction-Correction Cycle
    d. Extended Kalman Filter
        i. Nonlinear Dynamic Systems
        ii. First Order Taylor Series Expansion
        iii. Extended Kalman Filter: Prediction-Correction Cycle
3. Application (3 hours)
    a. Lab 1: Beginner Simulations from Ref 1
    b. Lab 2: Matlab Simulations
        i. Option 1: Arduino IMU and MoCap
        ii. Option 2: Pendulum (LEGO?)

iii. Option 3: SLAM from Ref 5
    1. What is SLAM
    2. EKF-SLAM basics
    3. Simulation Run

c. Final: Written Test

Reference

1. Beginner tutorial: https://home.wlu.edu/~levys/kalman_tutorial/
2. Probabilistic Robotics: http://www.probabilistic-robotics.org/
3. Alpha beta gamma filter: https://en.wikipedia.org/wiki/Alpha_beta_filter
4. Simulation for Self-driving Car EKF: http://jeremyshannon.com/2017/04/21/udacity-sdcnd-extended-kalman-filter.html
5. SLAM Simulations: https://github.com/OpenSLAM-org/openslam_bailey-slam