Course Content	
Course Title (English)	Detection and Estimation Theory
Course Title (Chinese)	偵測與評估
Credit	3
Instructor	Prof. Ju-Hong Lee 李枝宏 教授
Outline	DETECTION & ESTIMATION provides the mathematical background in studying Detection Theory and Estimation Theory. The Detection Theory is an engineering term for what the statistician calls Hypothesis Testing or Decision Making. The problem is one of taking measurements and then estimating in which of a finite number of states an underlying systems resides. It is used to select the physical or mathematical model from a finite class of models, that best describes measured phenomena. The Estimation Theory is an engineering term for what the statistician calls Parameter Estimation or Point Estimation. The problem is one of taking measurements and estimating the numerical value of a real or complex vector that describes the system under study. It is used to identify unknown, information-bearing parameters in a physical or mathematical model. In this course, we will discuss the following related topics: 1. Elements of Hypothesis Testing – Bayesian, Minimax, Neyman-Pearson and Composite Testings. 2. Signal Detection in Discrete Time – Models and Detector Structures, Performance Evaluation of Signal Detection Procedures, Sequential Detection. 3. Elements of Parameter Estimation – Bayesian Parameter Estimation, Nonrandom Parameter Estimation, Maximum-Likelihood Estimation.

	4. Elements of Signal Estimation – Kalman-Bucy Filtering, Linear Estimation, Wiener Filtering. 5. Signal Detection in Continuous Time – The Detection of Deterministic Signals in Gaussian Noise, The Detection of Random Signals in Gaussian Noise. 6. Signal Estimation in Continuous Time – Estimation of Signal Parameters, Linear Estimation.
Goal	The Detection Theory is an engineering term for what the statistician calls Hypothesis Testing or Decision Making. The problem is one of taking measurements and then estimating in which of a finite number of states an underlying systems resides. It is used to select the physical or mathematical model from a finite class of models, that best describes measured phenomena. The Estimation Theory is an engineering term for what the statistician calls Parameter Estimation or Point Estimation. The problem is one of taking measurements and estimating the numerical value of a real or complex vector that describes the system under study. It is used to identify unknown, information-bearing parameters in a physical or mathematical model.
English Teaching	☐ YES ■ NO
Teaching Material	■ English ☐ Chinese