MECH 6325 – CA 1

$$G(s) = \frac{B(s)}{A(s)} \qquad B(s) = b_0 + b_1 s + b_2 s^2 + \cdots + b_{n-1} s^{n-1}$$
$$A(s) = 1 + a_1 s + a_2 s^2 + \cdots + a_n s^n$$

$$A(s)\,G(s) = B(s)$$

$$\varepsilon = A(s)\hat{G}(s) - B(s)$$

$$\varepsilon = (1 + a_1 s + a_2 s^2 + \cdots)\,\hat{G} - (b_0 + b_1 s + b_2 s^2 \cdots)$$

$$\varepsilon = \hat{G} + a_1 \hat{G} s + \cdots + a_n \hat{G} s^n - b_0 - b_1 s + \cdots b_{n-1} s^{n-1}$$

$$\varepsilon = \hat{G} - \begin{bmatrix} -\hat{G} s & \cdots & -\hat{G} s^n & 1 & s & \cdots & s^{n-1} \end{bmatrix} \begin{bmatrix} a_1 \\ \vdots \\ a_n \\ b_0 \\ b_1 \\ \vdots \\ b_{n-1} \end{bmatrix}$$

($\hat{G}$ = X, the bracketed row = $-H$)

$$\varepsilon = X - H\hat{X} \qquad J = (X - H\hat{X})^*(X - H\hat{X})$$

$$\Downarrow$$

$$X = (H^* H)^{-1} H^* Y$$