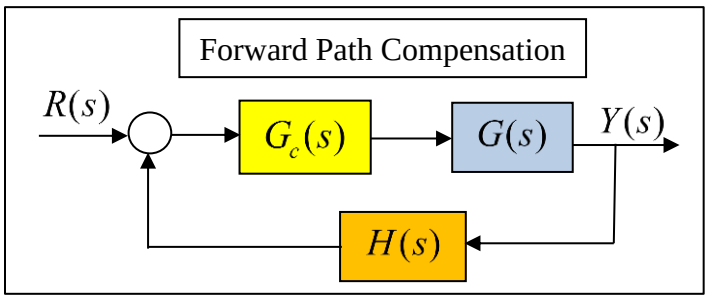
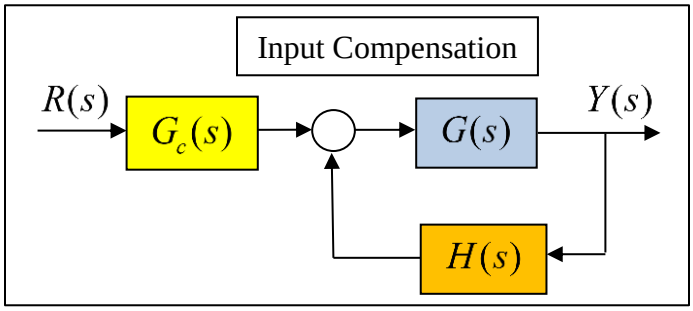
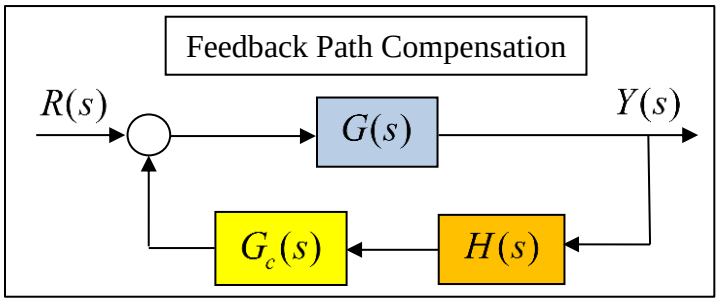
Introductory Motion and Control
Introduction to Compensator Design

The control system design problem involves ***two basic steps***. The first step is to decide ***what components*** to add to the system and in ***what locations***. Generally, controller components can be ***added*** to the ***forward path***, ***feedback path***, or ***input path*** of the feedback loop as illustrated in the following diagrams. Combinations of these positions can also be considered.

Having chosen the ***location*** of the controller components in the control loop, the next step is to ***design*** the components, so they ***compensate*** for poor performance characteristics of the original system. Obviously, the ***more components*** a system has, the ***more expensive*** it will be.







The notes contained herein will focus on compensators in the ***input*** and ***forward paths*** of the system. The goal is to design the control components to meet closed-loop specifications relating to ***settling time***, ***percent overshoot***, ***steady-state error***, ***bandwidth***, ***stability*** and ***disturbance rejection***. The addition of control components ***changes*** the ***root locus*** and ***Bode diagrams*** of the system. It is the analyst's job to ***design*** the control components to provide ***beneficial*** changes to these diagrams, and consequently, provide acceptable closed-loop performance.

Keep in mind that, in practice, the plant (or process) can also be changed to meet ***performance specifications***. A well-designed controller may not be able to compensate for an otherwise poorly designed system. All components within the control loop should be designed (or chosen) to work together safely and effectively.