# ME 417
## Design of Alternative Energy Systems

### Fuel Cell Problems

1. Determine the ideal voltage, current, and required mass flow rate of hydrogen for an ideal air/hydrogen fuel cell operating at 101 kPa and 350 K that is producing 25 kW.

2. Determine the ideal voltage, current, and required mass flow rate of ethanol ($C_2H_6O$) for an ideal air/ethanol–water fuel cell operating at 101 kPa and 280 K that is producing 500 kW. You may take the $c_P$ of ethanol to be 2.77 kJ/(kg·K).

3. Determine the ideal voltage, current, number of stacks required, and required mass flow rate of isopropanol ($C_3H_7OH$) for an ideal air/isopropanol –water fuel cell operating at 101 kPa and 298 K that is producing 50 kW. You may take the following properties for liquid isopropanol.
   $c_P$ = 2.35 kJ/(kgK)
   $\overline{h}_f = -316{,}000 \, kJ/kmole$
   $\overline{s}^o(at \, 298K) = 194.6 \, kJ/(kmole \cdot K)$