EE490 Project Milestones: Fall 2014
LED Lighting Fixture Development for Horticulture Applications
- Driver and Control Electronics
Milestones and Evaluation

Stage 1: Initial development of basic system control features (60%)

Milestone 1: 10 pts. Due Wednesday, Week 2, 3:35-5:40 p.m. [-1 pt./day late submission]

1. Development of a clear interdisciplinary understanding of the project through individual student and team study.
   Topics to consider: 1) LED lighting applications (with focus on horticultural applications), 2) LED lighting issues (environmental, societal, economic, technical), 3) photosynthesis and light properties, 4) LED characteristics, 5) LED lighting system electronic components.

[For introduction, read/study the 3 resource articles available on the course Blackboard. Then perform literature research (to include at least 2 additional reference articles) to further address the topics listed above in more detail.]

Deliverable: 5 page engineering report (~ 1 page per topic above) from each team summarizing your findings/understanding of the project. (Cite the additional reference articles in the report).

Milestone 2: 10 pts. Due Wednesday, Week 3, 3:35-5:40 p.m. [-1 pt./day late submission]

2. Basic control design concepts with Arduino Uno by demonstrating and documenting 2 control features*: i) Analog input controlling a Digital output, and ii) 2- channel PWM output.*
   - ***i)*** ***Analog input controlling a Digital output development and demonstration. Read an analog input voltage (potentiometer wiper arm voltage divider) $0 < V_{analog} < 5$ V and light an indicator LED if $V_{analog} > 2.5$ V. Laboratory demonstration of Arduino A/D Sketch using a DVM to monitor V_{analog}.***
   - ***ii)*** ***PWM output development and demonstration. 2-channel PWM signal generation with fixed frequency f = 200 Hz and fixed duty cycle, $D_{Ch1} = 20\%$ and $D_{Ch2} = 80\%$. Laboratory demonstration of Arduino 2-channel PWM Sketch using Oscilloscope to display both PWM signals simultaneously. Set Oscilloscope to display measurement of D_{Ch1}, D_{Ch2}, and f_{PWM}.***

   Deliverable: Laboratory demonstration (all team members) and 3-5 page engineering lab report from each team that includes laboratory demonstration experimental description, Arduino Sketch documentation, and oscilloscope display results.

Milestone 3: 10 pts. Due Wednesday, Week 4, 3:35-5:40 p.m. [-1 pt./day late submission]

3. Continuation of basic control design concepts with Arduino Uno by demonstrating and documenting 3 control features, *i) 2-channel Analog input potentiometer control of PWM output duty cycle, ii) 500 ms delay on start- up and 500 ms ramp-up to potentiometer set point PWM duty cycle, and 3) Arduino input from 12 V fan load; controlling PWM Off (duty cycle = 0) if fan blade is locked/stalled (not spinning).*
   [Laboratory demonstration of each Arduino control feature, as appropriate]
   Deliverable: Laboratory demonstration (all team members) and 3-5 page engineering lab report from each team that includes laboratory demonstration experimental description, Arduino Sketch documentation, and experimental data, as appropriate.

Milestone 4: 10 pts. Due Wednesday, Week 5, 3:35-5:40 p.m. [-1 pt./day late submission]

4. Basic LED Light Fixture Design and Assembly including LED placement and soldering, DC power supply, Arduino controller packaging (On/Off switch potentiometer controls, control and power wiring, and Light Fixture hanging hardware).
   [Laboratory inspection and assessment of overall LED Light Fixture assembly]
   Deliverable: Laboratory inspection (all team members) of complete LED Light Fixture assembly.

Milestone 5: 20 pts. Due Wednesday, Week 6, 3:35-5:40 p.m. [-1 pt./day late submission]

5. Basic LED Light Fixture Design Functionality including On/Off switch, 2-channel analog input potentiometer dimming (power spectral density control), fan stall shut down control, delay and ramp up to set power spectral density level.
   [Laboratory demonstration and assessment of Basic LED Light Fixture functionality]
   Deliverable: Laboratory demonstration (all team members) of Basic LED Light Fixture functionality and 5 page mid-project report detailing Stage 1 design and development.