

ECE 466: Integrated Lighting Systems

IN

OUT

Circuit Theory

- Basic electric AC and DC circuits from ECE
- Understand operation of first and second order circuits
- Understand principles of power factor correction
- Apply superposition, source transformation, Thevenin and Norton theorems
- Knows configuration of three-phase circuits
- Apply formulas for balanced connections

Heat Transfer

- Basic thermodynamics

Pre-requisites

- ECE 331

Concepts:

- CFL and LED lights and the need for associated electronic drive needs and their efficacy (LM/W) and efficiency
- Electron to photon converter concepts and the electromagnetic spectrum
- Color versus wave length concepts from light sources and color spectrum metrics of a light source
- Power electronic energy sources driving fluorescent AC and DC light sources
- Engineering circuit and heat flow laws for electronic drivers and various light sources
- Contrasts of physical laws and mandated limits of harmonic injections to the electric grid

Applications:

- Indoor and outdoor lighting for commercial and residential use
- Applications of LED lights to horticulture
- Backlights for LCD panels
- Organic LEDs on flexible plastic substrates for advance lighting systems
- Niche applications of LED's and lasers to HD, 4K, and 8K projection displays with increased color spectrum

Tools:

- Light source and optical ray tracing commercial programs from the illumination industry

Lighting System Requirements

- Explain the rise and demise of incandescent lighting via both government energy efficiency policy and return on investment
- Identify alternative linear fluorescent, LED light sources and compact fluorescent lights (CFL) to incandescent lighting
- Explain alternative LED light sources that have a wide color spectrum for use in displays
- Explain Watts to Lumens efficacy and separate electrical power into optical power efficiency available from all three light sources versus cost and total return on investment
- Analyze power electronic drives for CFL and LED light sources to achieve dimmable operation

Light: Commercial and Retail

- Explain the special requirements on efficiency and color index of light sources for applications in room lighting, horticulture, and color displays
- Know the required light illumination levels and spatial illumination profiles for street and tunnel lighting
- Explain the role of heat removal from electronic components in light fixtures to achieve long fixture lifetimes
- Explain recycling of hazardous and toxic electronic and optical components (ROHM) laws