1. ECE 466: Integrated Lighting Systems

2. 3 credits: 2-75 minute lecture sessions/week, 1 credit weekly lab assigned

3. George Collins

4. None required
    a. Lighting Control Technology and Applications. Simpson, R. 2003.
    b. Power Electronics Handbook. Rashid, M. 2017.
    c. Fundamentals of Heat and Mass Transfer. Bergman, T. 2017.

5. Course Information
    a. Technical underpinnings of light sources, their associated heat sink fixtures and power electronics drivers
    b. Prerequisites: ECE 331
    c. Selected Elective: Computer Engineering; Electrical Engineering

6. Goals for the Course
    a. Course Learning Objectives
        i. Examine the use of fundamental concepts of photons, commercial light emitting devices, light sensors and associated electronic drivers of light devices to achieve optimum lighting solutions for varied applications
        ii. Analyze the advantages of solid state light emitters, fluorescent lights and electrochromic windows acting in concert with light sensors to form the wireless internet of light device solutions in a building or road illumination scenario throughout the 24/7/365 cycle
        iii. Apply concepts color photonics to allow the desired full color gamut for both commercial lighting and wide area optical displays by tailoring the optical spectrum of light emitters employed and associated driver electronics
        iv. Develop the framework for analyzing system wide light solutions by balancing the greatest energy efficiency, reliability, cost, and desired lighting characteristics
        v. Evaluate different cases of projection, LCD and OLED displays versus cost for portable devices
        vi. Create SPICE and other computer models for conducting energy efficiency studies and balanced color spectrum goals for 1-4 above for applications in: road illumination, building lighting, stadium lighting, displays and medical optically augmented instruments

    b. Student Outcomes
        1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
        2. An ability to apply the engineering design process to produce solutions that meet specified needs with consideration for public health and safety, and welfare, as well as global, cultural, social, environmental, and economic factors

3. An ability to communicate effectively with a range of audiences
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. An ability acquire and apply new knowledge as needed, using appropriate learning strategies

7. Topics Covered

History of lighting
Incandescent lighting
Gasses
LED solid state lighting devices
Physics of PN light emission
Intensity and color control by PWM electronic drives
Electronic powering LED luminaires
Grid powered LED electronic drives
Heat removal with LED fixtures
Organice LEDS (OLEDS)