DOLL Academy 2 day course plan

Course plan (temporary)

Day 1

9-9:15: Welcome and introduction
9:15-10: Introduction to LED technology
10-11: Photometry
11-12: Colorimetry
12-13: Lunch
13-14: Demonstration: (Integrating sphere, goniometer)
14-15: Flicker with demonstration (flicker, dimming of LEDs)
15-17: Practical exercise: Spectrometers, flicker and luminance

Day 2

9-10: Additive color mixing and color perception
10-11: Color Rendering Indices
11-12: White light generation
12-13: Lunch
13-14: Light and Health
14-15: Guest lecture (lighting design, health, etc)
14-16: Practical exercise: Integrating spheres and goniometers
16-17: Sum up of the course
17: Thanks and goodbye

Topics in more detail

- Introduction to LED technology
  - Electric energy usage for Lighting
  - LED history and future (Nobel Prize 2014)
  - How does LEDs work? (PN-junction)
- Photometry
  - Quantities and definitions
  - Efficiency and efficacy
- Colorimetry
  - Theory of color measurement
  - Color matching functions
  - Color spaces and Chromaticity diagrams (CIE 1931(x,y), Uniform (u,v)-diagram)
  - Correlated Color Temperature
- Additive color mixing
- Color Rendering Indices
  - CIE CRI Ra
  - TM-30
- White light generation
  - RGB mixing
  - Wavelength converters
  - Efficiency/quality trade off
- Color perception
  - Illusions
- Flicker
  - Metrics (Percent Flicker (PF) / Flicker Index (FI) / Visibility Measure (Mv))
  - Standards and recommendations
  - Dimming
- Light and health
  - Circadian sensitivity
  - Temporal Light Artefacts (TLAs) / flicker
- Equipment
  - Spectrometers
  - Integrating Spheres
  - Goniometers
- Guest lectures:
  - E.g. lighting design

Practical exercises

- Spectrometer to measure:
  - Spectra
  - Chromaticity coordinates
  - Correlated color temperature
  - Color rendering
- Integrating spheres to measure:
  - Luminous flux
  - Efficacy
  - Spectra
- Goniometer to measure:
  - Light Intensity Distribution (LID)
- Flicker measurements using:
  - LabVIEW
  - Mobile phone camera
- Luminance measurement using:
  - Luminance camera Techno Team
  - Classical luminance meters

Physical demonstrations

- Inspection of a rack with different light sources using pocket spectroscopes
- Color mixing (Red, green and blue projected on white surface to generate cyan, magenta, yellow and white) and/or (laser pointers into small integrating sphere)
- Integrating sphere (principle and scattering)
- Stroboscopic effects and phantom arrays of flicker
- Dimming of LEDs