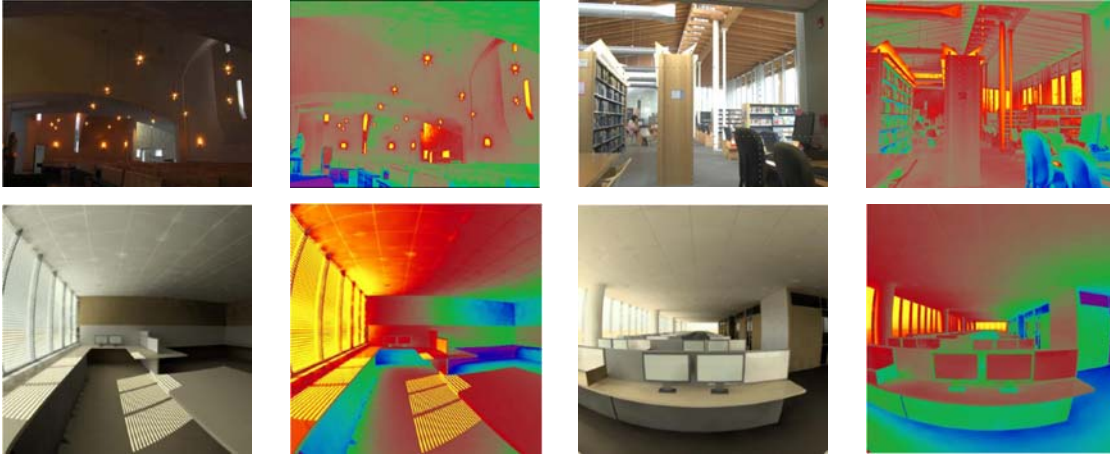


# Arch 582

## Computational Lighting Design and Analysis

University of Washington, Department of Architecture



(Examples of Student work from previous years)

Instructor: Mehlika Inanici, Ph.D.  
Office: Architecture Hall 130M  
Email: [inanici@uw.edu](mailto:inanici@uw.edu)  
Office hours: Wednesdays (by appointment)

Credits: 3 credit hours  
Schedule: Winter 2012, Tue / Th. 4:00 – 5:20  
Location: Digital Commons (Gould 007)

Class email: [arch582a\\_wi12@uw.edu](mailto:arch582a_wi12@uw.edu)  
[arch582b\\_wi12@uw.edu](mailto:arch582b_wi12@uw.edu)  
Website: <http://courses.washington.edu/arclight>

### ***Description***

Lighting design is a decision-making process that integrates daylight apertures, surface materials, and colors, lamps, luminaires, and lighting controls. The choices affect the resultant visual effects, comfort, and performance. Computational approaches provide rich visual and numerical environment with a large variety of information and analysis capabilities.

Computational Lighting Design is an innovative course that draws from recent developments in lighting simulation, visualization, per-

pixel data measurement and analysis techniques. It provides an understanding of the theoretical aspects of computer applications for lighting design and analysis; and the practical knowledge of tools and techniques that enhance the integration of the lighting analysis into the architectural design process.

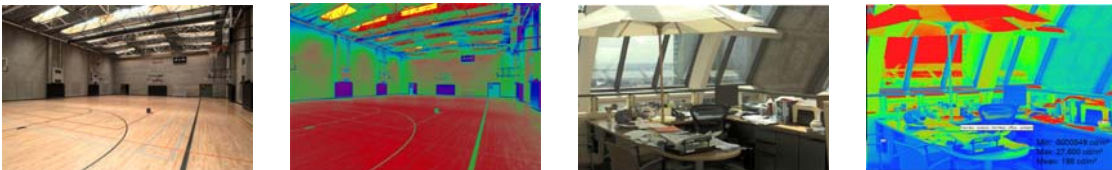
## **Objectives**

- Provide an overview of principles, theories, methods that underlie the applications of computers in lighting design and analysis;
- Create awareness and familiarity with the current issues in the lighting community;
- Provide hands-on experience with the state of the art lighting simulation, visualization, per-pixel measurement and analysis tools.

## **Contents:**

The content of the course is presented through a series of lectures, class discussions, and lab sessions.

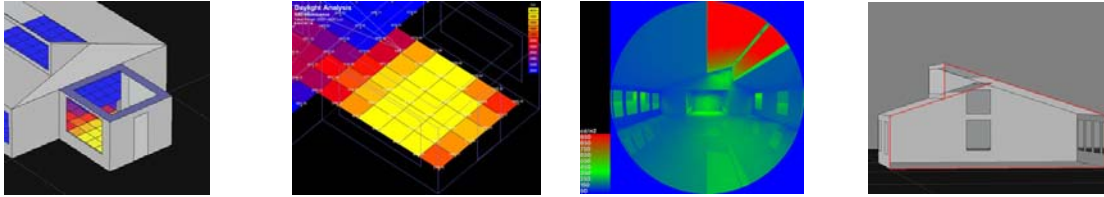
## *High Dynamic Range (HDR) Photography:*



(Examples of Student work from previous years)

HDR photography is a computational photography technique where multiple exposure photographs are fused into a single HDR image. A single HDR image captures an entire array of lighting measurement data with a common digital camera. This part of the course predominantly incorporates “observation”, “analysis of HDR images” and developing an “understanding” for the qualitative and quantitative aspects of luminous environments.

## *Lighting simulation / visualization*



(Examples of Student work from previous years)

Students learn how to perform lighting simulation and visualizations using Radiance and Daysim through Ecotect interface. This part of the course predominantly incorporates the “exploration” of analytical approaches in design synthesis, with the objective of promoting informed design decision making through simulation and visualization.

### **Schedule:**

Jan 3	Introduction
Jan 5	High Dynamic Range imaging (HDRI)
Jan 10	Lighting analysis with HDRI
Jan 12	Hands-on HDR assembly
Jan 17	Tone Mapping with HDRI
Jan 19	Case study: Computational methods of lighting design and analysis
Jan 24	Introduction to Lighting simulation
Jan 26	Introduction to Ecotect
Jan 31	Student presentations – Project1
Feb 2	Student presentations – Project1
Feb 7	Introduction to Radiance: Illuminance and Luminance analysis
Feb 9	Introduction to Radiance: Illuminance and Luminance analysis

Feb 14	Lighting simulation and visualization with Radiance
Feb 16	Lighting simulation and visualization with Radiance
Feb 21	Lighting simulation: Material definitions
Feb 23	Climate based Daylighting Simulation
Feb 28	Daysim: Daylight Autonomy and Useful Daylight Index
Mar 1	Daylighting analysis of Elektra house
Mar 6	Work session: Individual critics on Project
Mar 8	Work session: Individual critics on Project 2
Mar 14	Student presentations

## Readings:

There are no textbooks for this class. However, various books, articles, and websites are going to be assigned and/or suggested to support further in-depth inquiry of specific topics. The following websites are recommended as general resources:

Photosphere: High Dynamic Range Image browser for Mac OSX

<http://www.anywhere.com/>

Radiance Lighting Simulation and Visualization system

<http://radsite.lbl.gov/radiance/HOME.html>

Radiance Online Group: <http://radiance-online.org/>

Daysim: <http://daysim.com/>

Ecotect: <http://www.ecotect.com>

## ***Student Responsibilities:***

1. Attend all classes; participate actively and meaningfully to class discussions. Complete the tutorials and exercises in lab sessions. The lab sessions should be viewed as experiments that illustrate the principals presented in lectures.
2. Submit projects and class exercises on their due dates. Late submissions up to 3 days late will automatically lose 10% of the possible points. Submissions that are more than 3 days late will lose 25% of the possible points. If you have a medical or personal emergency, please notify me before the submission date.
3. E-mails sent to the class mail group are required reading. Course materials made available on the class web pages should also be considered required reading.
4. Always make a back-up copy of your work. This is common sense and it is a course requirement.

There are two projects for this class. The first project is an opportunity to analyze an existing architectural space with “HDR photography” technique. In the second project, you are asked to utilize “lighting simulation and visualization” tools to analyze and design a luminous environment. You will use an architectural setting and analyze different design alternatives through computer simulation. The objective of the analysis is to provide feedback to the design process. There is also one class exercise that is graded. It is a simulation exercise that is given to assess your progress.

The due dates for the projects and class exercise are given as follows:

<b>Jan 31, Feb 2</b>	Project 1: HDR Photography and image analysis
<b>Feb 23</b>	Class exercise
<b>Mar 15</b>	Project 2: Lighting Simulation and Visualization

The final grading will be determined based on the following:

1. Project - 1: (40%)
2. Class exercise (10%)
3. Project - 2 (50%)