ASSIGNMENT SUMMARY
This project is an exploration of general techniques that can be used to light planar surfaces, such as walls and ceilings. This assignment will build your vocabulary and technical skills in lighting design and with AGi32.

LEARNING OBJECTIVES
- Technically realize the illumination of a wall using several techniques, including linear/uniform washing, washing that creates scalloping, grazing, and surface illumination using in-grade equipment.
- Be able to describe light using an evidence-based and data-driven cause/effect paradigm, where light is manipulated (as an independent variable) to modify the light distribution and associated appearance of a surface (as dependent variables). Analyze and interpret the photometric conditions and use engineering judgement to draw conclusions about the illumination of the surface.
- Gain experience with selecting, placing, and aiming lighting hardware to achieve desired lighting outcomes.
- Deepen your familiarity with AGi32, including appreciation of its strengths and limitations.
- Produce a professionally prepared report that showcases your work and that you can use in job interviews.

LEARNING OUTCOME MAPPING

<table>
<thead>
<tr>
<th>Course Learning Outcome</th>
<th>ABET Student Learning Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>4. Report the results of your design process orally in the form of a professionally prepared presentation and in writing in the form of a professionally prepared report.</td>
<td>3. An ability to communicate effectively with a range of audiences.</td>
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<tr>
<td>5. Be able to perform a parametric comparison where one lighting variable is systematically varied and a dependent measure is analyzed.</td>
<td>6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions</td>
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BACKGROUND
Read this article:

To access Leukos, log in to the IES website using the OSU username and password. Then click through to the Leukos website. Logging in to the IES website first will give you free access to all articles published in Leukos. Or, you could log into Leukos through the Taylor & Francis portal from a OSU computer, in which case Taylor & Francis should recognize that OSU subscribes to Leukos.

A frequent goal of lighting design is to enhance architectural form. Shape, pattern, rhythm, texture, and other formal qualities of architecture can be amplified with the intelligent use of light, or spoiled with light’s misapplication. Architecture is a composition of surfaces. Surfaces can be vertical, horizontal, sloped, or curved. Different surfaces may intersect in an infinite number of ways to create an infinite number of shapes and volumes. It follows that, to effectively render space, the lighting of architectural surfaces is an important tool in the craft of architecture and architectural lighting design.

Bear in mind that lighting is always context specific; a technique that may be ideal in one situation may be inappropriate in another. Here are some items that might be considered as part of programming and schematic design, especially when the rendering of the visual environment is a foremost design consideration:

- It may be desirable to wash a smooth planar wall with frontal light, whereas it may be preferable to showcase a textured wall using a grazing technique.
- Rounded scallops on a planar wall are often undesirable because they create a lighting pattern discordant with the architectural form, though they can sometimes be used with good effect to create a (superimposed) rhythmic pattern.
- Surfaces can be short, such as the wall of a lobby, requiring short “throw” distances. Surfaces can be tall, such as the face of a skyscraper, requiring entirely different light sources and luminaires but similar techniques.
- Surfaces can be front-lighted from the top, bottom, sides, or any combination. Some surfaces can be illuminated from behind.
- In principle, a planar surface can be illuminated with any type of light source: daylight, halogen, fluorescent, HPS, Metal Halide, LED. Today, nearly all new installations will make use of LED luminaires, though LEDs still represent just a small fraction of installed lighting. The selected lumen output, luminous intensity, and optical distribution will depend on the size of the surface being illuminated, available mounting locations, desired color characteristics, and code considerations (e.g., connected power limits), among other considerations.
- Lighting design solutions that are truly integrated with architecture are usually more successful than solutions driven primarily by hardware or decoration. To that end, it’s often desirable to hide the lighting hardware, as with wall slots, valences, recesses, semi-recesses, niches, or any number of creative ways to shape the architecture so that the building itself conceals the gear, and selected surfaces appear luminous.

Surfaces are important elements of architecture, and therefore the various methods used to light surfaces are fundamental building blocks in the vocabulary of lighting design techniques.
This project is a study of different techniques and hardware that can be used to light a vertical surface of modest size. It is an exploration of techniques that can be applied in many different contexts. It is intended to build your conceptual development skills in lighting design and your technical skills with AGi32. The techniques you’re exploring are generic and will have application in many other contexts.

**METHODS**

The room under consideration for this project is 20’ (width) × 50’ (length) × 18’ (height). Ceiling, walls, and floor reflectances are 80-50-20 percent, respectively. The vertical surface of interest is one of the longer walls that measures 50’ × 18’. Within your computer model, treat this surface as a flat plane without texture, such as painted drywall (i.e., the default AGi32 material).

While the focus of this assignment is on the technical accomplishment of lighting this one wall, you are encouraged to define the room interior to provide appropriate context. For example, this could be a lobby in an office building or condominium complex, or a gallery in a museum, or a transitional corridor in a transportation hub. Including furniture, people, or other objects in your AGi32 model and final renderings has the potential to improve the realism and believability of your final solutions.

Develop solutions for the following scenarios:

<table>
<thead>
<tr>
<th>Scenario Number</th>
<th>Lighting Technique</th>
<th>Luminaire Type</th>
<th>Source</th>
<th>Considerations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1**</td>
<td>Wall-washing</td>
<td>Linear semi-recessed*</td>
<td>LED</td>
<td>Use appropriate set-back and aiming to achieve a visually uniform wash</td>
</tr>
<tr>
<td>2</td>
<td>Wall-grazing</td>
<td>Linear recessed wall slot</td>
<td>LED</td>
<td>Select and position luminaires to provide approximately uniform grazing on the wall surface</td>
</tr>
<tr>
<td>3</td>
<td>Scalloping</td>
<td>Circular (or square) recessed</td>
<td>LED</td>
<td>Use appropriate setback and aiming to achieve a rhythmic pattern of scalloping.</td>
</tr>
<tr>
<td>4</td>
<td>Uplighting</td>
<td>Linear or circular (or square) in-grade</td>
<td>LED</td>
<td>Use setback and spacing to uplight the wall. Choose placement and aiming to either wash or graze the wall—your choice.</td>
</tr>
</tbody>
</table>

*If you prefer to use a recessed luminaire, that may also be okay, but it might limit or eliminate your ability to rotate the luminaire. If want to study wall washing with a recessed luminaire, then talk to me first.

**For scenario 1, you are further asked to create a set of (at least) six parametric comparisons where you systematically vary just one lighting variable. For example, you could systematically adjust the set-back distance. Or you could systematically adjust the aiming angle. For each parametric case, use AGi32 to quantify the light on the wall.
In what ways can the light on the wall be quantified? We will discuss this together, and you are ultimately responsible for quantitatively documenting the performance of each scenario, but here are suggestions:

- Average illuminance. This is a blunt but useful measure, though a mean is really only informative (on its own) if it is representative of the entire surface. Make sure you understand why.
- Measures of dispersion around the mean. Ratios such as $E_{\text{Max}}:E_{\text{Min}}$ and $E_{\text{Max}}:E_{\text{Avg}}$, and $E_{\text{Avg}}:E_{\text{Min}}$ provide information about the spread in the data.
- The coefficient of variation (CV) is a useful standardized measure of dispersion.
- Application efficacy. Compute the total number of lumens on the target surface, divided by the total system wattage.
- You might also divide the wall into horizontal bands to analyze the gradient from ceiling to floor. Pick a position, say the center of the wall, and plot the gradient from ceiling to floor under the different scenarios.
- A similar approach can be taken by dividing the wall into vertical bands to analyze the gradient from left to right.

Page 15.9 of IES Handbook 10th edition (available for review in the CCE Library) mentions a 10:1 ratio as typically acceptable for uniform surface appearance when a surface has a monolithic tone. This should not be considered definitive guidance, but it is one suggestion to be considered along with the recommendations of Dr. Schielke.

DELSIVERABLES

Deliverable #1 Written Report
The format for the written deliverables can be:

A. Format Option #1: Produce your deliverables as a website. The content listed below is still expected, though producing the work as a webpage may offer more creative freedom. If this is your choice, please provide the URL for your deliverable.
B. Format Option #2: Produce your deliverable in PDF format with a page size of either 8½ x 11 or 11 x 17, or a combination of these page sizes. The larger page size may afford some flexibility in how you visually present your work.

Whether as a website or PDF, your final report should (at least) contain these components:
1. Cover Page
2. Typed executive summary. This should be prose, perhaps with brief bulleted list of important information. The executive summary should summarize:
   - Project requirements
   - Design criteria
   - Your solution
   - Results (with reference to design criteria)
   This should be self-contained. Very likely, it should be the last part of the report that you write. For a project this size, a few paragraphs are sufficient.
3. Typed table of contents
4. The body of the report should include:
• **Introduction**: Summarizes the project requirement and give a preview of what’s to follow. Note that and *Introduction* is not the same as an *Executive Summary*. (1 – 2 paragraphs.)

• **Methods**: Summarize how you arrived at your solutions. What tools and procedures did you use to complete this project? (1 – 3 paragraphs.)

• **Results**: The appendix that comes later will summarize each individual scenario, and so you need be redundant. Instead, **focus on providing comparative data through graphics and/or tables**. The results should summarize how the different scenarios perform on salient performance criteria. (1 page is probably enough. Not more than 2 pages.)

• **Discussion**: There are two main sub-topics in the discussion: 1) discuss the similarities and differences between scenarios 1 – 4; 2) discuss the similarities and differences between scenarios 1a – 1x. Both discussion should bring meaning to the data. Use your data to make inferences: How does the data suggest that grazing is different from washing? What did you learn from the parametric comparisons across scenario 1? What are the limitations of using AGi32 to communicate washing and grazing techniques? These questions are not intended to be exhaustive, but rather representative of the things that you should be considering and addressing in your report. Figures are much more useful that tables and are often more compelling that text. Use figures to display data and text to explain the data. Take care not to over-generalize—internal validity may not translate to external validity. (Not more than 1.5 pages)

• **Conclusions**: This is essentially a summary of your discussion, with a restatement and emphasis on the most salient points. (1 – 2 paragraphs)

5. **Appendix** (4 pages):

• Each scenarios should be summarized on one sheet of paper. For the first scenario, just choose the one “best” solution from the parametric options studied. Preparation of these summary sheets will be repetitive in the sense that each page should contain the same type of information, presented in the same format. Think carefully about the format for which you will present your information. *The graphical communication of your results is an important part of the grading criteria.*

• The specific information that you include on each appendix page is at your discretion. What is important is that each page provides adequate information to fully describe how the wall is illuminated and the visual effect that will be achieved. Consider including the following:
  - Technique used to illuminate the surface (including layout details such as setback, aiming, spacing)
  - Photographic image of the luminaire (as can generally be found on the manufacturer’s web site)
  - Description of the luminaire, including the product number and order code
  - Quantitative performance summary (e.g. numerical illuminance and/or luminance summary, uniformity statistics)
  - Any other technical considerations needed to communicate your design
  - Total connected watts
  - A rendered view
Brief written evaluation of the lighting solution.

- Note: You should include something in your rendered image to provide a sense of scale, such as people or familiar objects (e.g., chairs, tables, doorways). These could be included in your AGi32 model, or added via Photoshop or with other software.
- It should be intuitively easy for someone unfamiliar with your project to make apples-to-apples comparisons between the different lighting solutions by making comparisons between the different summary sheets.

6. Work-log
7. Copy of this assignment

This is an option to showcase your work. Please don’t use a stock Microsoft template; I have every confidence that your work can be more visually appealing.

**Deliverable #2 Oral Presentation**

Below is a suggested outline for your presentation. In general, your presentation can follow the same order as your written report.

1. Introduction: Make this work relevant to your audience. Why is this topic of importance to applied lighting design? Why is it important to them? Give the audience a reason to want to learn more about what you have done.
   [Suggestion: One slide.]
2. Background: Move from generalities about lighting a wall to specifics about your project.
   [Suggestion: One slide.]
3. Methods: What was your process and what did you learn.
   [Suggestion: Could be one slide, could be a few.]
4. Results and Discussion: Present figures that show the trends that you found. This should include plots of data and renderings. The oral discussion should align with the discussion presented in your report.
   [Suggestion: Multiple slides. This should be far the largest part of your presentation, taking up the greatest number of slides and greatest amount of presentation time.]
5. Conclusions: Reiterate your main points with empathy for your audience. Make sure that there is a take-home message.
   [Suggestion: One slide.]

Presentations should be 8 – 10 minutes, followed by questions. Presentation order will be random selection. Good presentations have solid technical content, excellent supporting visuals, and are presented with polish and persuasion.

Related Documents on Canvas:
1. HW #1 Grading Rubric (1 page)
2. HW #1 Writing/Rewriting Example (1 page).