

Winter 2022

**COURSE CODE:** ARC3202HS

**COURSE TITLE:** Selected Topics in Advanced Computer Applications:  
Daylight and Electric Lighting Design

**PREREQUISITE COURSES:** N/A

**CLASSROOM LOCATION:**

Digital: <https://utoronto.zoom.us/j/81308113908>  
Meeting ID: 813 0811 3908  
Passcode: 632568

In person (if possible): [BA2179](#)

**CLASS HOURS:** Thursdays, 12:00 – 15:00

**INSTRUCTOR NAME:** J. Alstan Jakubiec

**INSTRUCTOR EMAIL:** [alstan.jakubiec@daniels.utoronto.ca](mailto:alstan.jakubiec@daniels.utoronto.ca)

**OFFICE HOURS:** Wednesdays 13:00 – 15:00 or by appointment

**OFFICE LOCATION:** DA 321 OR the Zoom link above

**TAs:** N/A

### **COURSE DESCRIPTION:**

Light is a critical aspect of architectural design and experience, the primary means by which occupants perceive the built environment. Lighting design is worthy of careful interrogation and criticism. This course asks its participants to understand and then go beyond typical lighting sufficiency standards to design excellent lighting for a program to be chosen by the individual. Broadly, the course employs historical understanding, measurement technology, and simulation software to understand, question, and redesign the existing lighting context we inhabit daily.

Selected topics in daylight and electric lighting design teaches natural and electric lighting design in an architectural context. Students will learn the scientific basis of light transport and visual perception and apply them to a course project—the comprehensive lighting design of a large communal gathering space with integrated electric and daylight systems. Individual activities and lectures focus on lighting measures and metrics, measuring light using calibrated high dynamic range photography, predictive electric and daylight simulations, material properties, visual comfort & perception, electric lighting design, lighting energy consumption, and scale model building & measurement.

### **COURSE OBJECTIVES:**

By the end of this course, a successful learner will be able to do the following:

1. Discuss and explain the physics of the behaviour of light,
2. Describe the relationship between lighting design, building energy performance, human comfort, and perception,
3. Measure lighting quantities using accurate techniques,
4. Produce physically-based lighting simulations with a high degree of quality,
5. Apply physical knowledge about lighting and information from lighting simulations to the design of building elements and spaces, and



6. Communicate and document a design process using lighting information via verbal, written and visual means.

### COURSE DELIVERY / SCHEDULE:

This course will be delivered synchronously and in-person if/when possible, all synchronous digital content will be automatically recorded and uploaded to Quercus for later consumption and review. Most sessions will consist of the following:

- (~30 minutes) Topical lecture
- (30 minutes – 1 hour) Discussion / presentations
- A 10 minute break
- (~1 hour) Workshop / activity

In addition, a short asynchronous video (< 30 minutes) will be uploaded as a preamble to the workshop each week, which you should lightly review before the course.

Date	Topic	Assignment
(Week 1) 13 Jan	<p><u>Lecture</u> Introduction to lighting architecture</p> <p>Course introduction, units, and perception of light review</p> <p><u>Discussion</u> Formal and material lighting effects from electric luminaires and daylighting systems (augmented by some slides and real time search)</p> <p><u>Workshop</u> Point-in-time calculations for daylight and electric lighting</p>	HW#1 – <i>Light and detail</i> assigned
(Week 2) 20 Jan	<p><u>Lecture</u> Material and material effects</p> <p>Opaque, 'clear', and translucent material properties</p> <p><u>Discussion</u> Selected <i>light and detail</i> precedents, quotidian materials</p> <p><u>Workshop</u> Defining custom materials (part 1) and using the spectral materials database, <a href="http://www.spectraldb.com">www.spectraldb.com</a></p>	
(Week 3) 27 Jan	<p><u>Lecture</u> Formally-driven lighting effects</p> <p><u>Discussion</u> <i>Light and detail</i> progress &amp; surprises, limits of computational perceptual analysis</p> <p><u>Workshop</u> Defining custom materials (part 2): Custom glass materials, using LBNL Window</p>	
(Week 4) 3 Feb	<p><u>Discussion (full-course)</u> <i>Light and detail</i> presentations and discussion</p>	HW#1 – <i>Light and detail</i> due in class

Date	Topic	Assignment
(Week 5) 10 Feb	<p><u>Lecture</u> Per-pixel lighting analysis and perception</p> <p><u>Discussion</u> What to measure? ... What we experience</p> <p><u>Workshop</u> HDR photographic measurement of lighting (if digitally delivered, we will calibrate the Daniels faculty cameras)</p>	<p>HW#2 – <i>Measuring light</i> assigned</p> <p><i>Design project</i> assigned</p>
(Week 6) 17 Feb	<p><u>Lecture</u> History of luminaire design and electric lighting (Pt. 1)</p> <p><u>Discussion</u> Constructed lighting quality, <i>measuring light</i> progress</p> <p><u>Workshop</u> Using IES files to simulate electric light</p>	
24 Feb	<b>Reading Week—No Class</b>	
(Week 7) 3 Mar	<p><u>Lecture</u> History of luminaire design and electric lighting (Pt. 2)</p> <p><u>Discussion</u> <i>Measuring light</i> outcomes</p> <p><u>Workshop</u> Simulating custom electric luminaires</p>	HW#2 – <i>Measuring light</i> due in class
(Week 8) 10 Mar	<p><u>Lecture</u> Photometry, building physical models</p> <p><u>Discussion</u> Strategies for building your physical models</p> <p><u>Workshop</u> Creating custom IES photometric files</p>	<p>HW#3 – <i>Physical model building</i> assigned</p> <p>(Out of class desk crit with Alstan – 15 min sometime this week)</p>
(Week 9) 17 Mar	<p><u>Lecture</u> A review of (day)lighting standards and beyond: IES LM-83, EN 17037, uniformity</p> <p><u>Discussion</u> Strengths / weaknesses of lighting standards</p> <p><u>Workshop</u> Calculating and communicating lighting metric standards</p>	

Date	Topic	Assignment
(Week 10) 24 Mar	<u>Lecture</u> Effects of light: Circadian rhythm, alertness, and visual comfort  <u>Workshop</u> Simulation of color and circadian effect using ALFA	(Out of class desk crit with Alstan – 15 min sometime this week)
(Week 11) 31 Mar	<b>If in person:</b> <u>Workshop / discussion (full course):</u> Measuring physical models  <b>If digital:</b> <u>Lecture / workshop</u> Measuring physical models  <u>Discussion</u> Measuring models and (if possible) some real-time examples of model lighting quality	HW#3 – <i>Physical model building</i> due
(Week 12) 7 Apr	<u>Discussion (full course):</u> <i>Design project</i> presentation and discussion	<i>Design project</i> due

**Important Dates:**

<b>Winter 2022</b>	
University Re-opens	Monday, January 3, 2022
First day of S/Y Classes	Monday, January 10, 2022
Final date to add S/Y courses	Monday, January 17, 2022
Last day to cancel without academic penalty	Sunday, February 20, 2022
Family Day (University Closed)	Monday, February 21, 2022
Reading Week – No Classes	Monday, February 21, 2022 to Friday, February 25, 2022
Last day of S/Y Classes	Friday, April 8, 2022
Final Examination and Studio Review period	Monday, April 11, 2022 – Friday, April 29, 2022 (including Saturday and/or Sundays)
Good Friday (University Closed)	Friday, April 15, 2022

Conflicts with religious observances should be brought to the attention of the course instructor and the Office of the Registrar and Student Services no later than the second week of classes. For more information, please see the [Policy on Scheduling of Classes and Examinations and Other Accommodations for Religious Observances](#).

**EVALUATION:**

Evaluation will be carried out in accordance with the University Assessment and Grading Practices Policy. Please refer to the policy located on the governing council website.

[http://www.governingcouncil.utoronto.ca/Governing\\_Council/policies.htm#G](http://www.governingcouncil.utoronto.ca/Governing_Council/policies.htm#G)

<b>Assignment</b>	<b>Due Date</b>	<b>Percentage of Final Marks</b>
Discussion participation	--	10%
HW#1 – Light and detail	3 February	20%
HW#2 – Measuring light	3 March	20%
HW#3 – Physical model building	31 March	20%
Design project	7 April	30%

The graduate grading scale is listed as letter grades. The graduate grading scale is included below for your reference:

<b>Graduate</b>		
Letter Grade Scale	Grade Meaning	Numerical Scale of Marks
A+		90 – 100%
A	Excellent	85 – 89%
A-		80 – 84%
B+		77 – 79%
B	Good	73 – 76%
B-		70 – 72%
FZ*	Inadequate	0 – 69%

\*FZ=Fail

Please refer to the University of Toronto Grading Practices Policy for additional information: <http://www.governingcouncil.utoronto.ca/Assets/Governing+Council+Digital+Assets/Policies/PD/F/grading.pdf>.

#### **LATE WORK:**

All assignments are due in class at the specified time and date. Late submission will result in a 10% deduction (of each assignment's total grade) per day (excluding weekends). In the case of illness or other special circumstance, notification should be given to the Instructors and the Registrar as soon as possible and before the deadline in question. A **Verification of Illness (Also known as a "doctor's note") is temporarily not required**. Students who are absent from academic participation for **any reason** (e.g., COVID, cold, flu and other illness or injury, family situation) and who require consideration for missed academic work should report their absence through the online absence declaration tool on ACORN. Additional information is available online: <http://www.illnessverification.utoronto.ca/index.php>

#### **FINAL DUE DATE:**

Due dates are set by the Instructor in the schedule and evaluation sections of this outline. All term work must be submitted on or before the deadline date stipulated by the instructor. Students who for reasons beyond their control are unable to submit an assignment by its deadline must obtain approval from their Instructor for an extension within the term. The last date of the winter term is April 29, 2022. Any work submitted after the stipulated deadline and before the end of term without an approved extension will not be accepted. Students will be required to petition to the School of Graduate Studies for an extension if they will be unable to submit their work by April 29, 2022. <https://www.sgs.utoronto.ca/policies-guidelines/coursework-extensions/>

Students are advised to contact their professors in advance of a deadline, where possible. Those students registered with Accessibility services should provide a letter from their advisor that confirms their registration and indicates their required accommodations. Please speak with Andrea McGee in the ORSS if you have any questions or concerns regarding their letter of accommodation and how to interpret the information. Otherwise, students should report their absence through the online absence declaration tool on Acorn and advisor their professor. Without any documentation, or where notice was not given, the ultimate decision is at the instructor's discretion.

## Remote/Online Courses

### Student Behaviour

All students registered at the University of Toronto are still required to conduct themselves in a respectful manner whilst undertaking studies online. The [Code of Student Conduct](#) applies and will be enforced regardless of the physical location where students are undertaking their studies. Offences against other persons will not be tolerated whether committed in person or online.

### Instructor Recording

This course, including your participation, will be recorded on video and will be available to students in the course for viewing remotely and after each session.

Course videos and materials belong to your instructor, the University, and/or other source depending on the specific facts of each situation and are protected by copyright. In this course, you are permitted to download session videos and materials for your own academic use, but you should not copy, share, or use them for any other purpose without the explicit permission of the instructor.

For questions about recording and use of videos in which you appear please contact your instructor.

### In Class Student Recording of Course Content

Note: In addition to the statement below, recordings of our class sessions will be uploaded to Quercus each week. You are still expected to be present each week, because the course will involve significant discussion as a small, elective course.

Students may create audio-recordings of the lectures for their personal use. Recordings are intended to permit lecture content review so as to enhance understanding of the topics presented. Audio-recordings are not substitutes for attending class.

Students should note that since audio recordings are to be permitted, their voice may be recorded by others during the class. Please speak to the instructor if this is a concern for you.

In accordance with the Accessibility for Ontarians with Disabilities Act, 2005, persons who have special needs will be accommodated.

Students agree to the following terms when creating audio recordings of lectures:

- Recordings are not to be distributed without the permission of the instructor via the Internet, using social media such as Facebook, peer-to-peer file sharing such as One Drive or Dropbox, or other distribution channels.
- Recordings are not to be shared with other classmates unless they are to be used in collaborative assignments, or if the instructor permits for other reasons.

Non-compliance with these terms violates an instructor's intellectual property rights and the Canadian Copyright Act. Students violating this agreement will be subject to disciplinary actions under the Code of Student Conduct.

**PREPAREDNESS AT UOFT:**

Students are advised to register for UTAAlert, the University's alert system, at <http://alert.utoronto.ca/>. UTAAlert sends important messages to registrants via text, email, and phone.

**ACCESSIBILITY NEEDS:**

The University provides academic accommodations for students with disabilities in accordance with the terms of the Ontario Human Rights Code. This occurs through a collaborative process that acknowledges a collective obligation to develop an accessible learning environment that both meets the needs of students and preserves the essential academic requirements of the University's courses and programs.

If you are a student who identifies with one or more of the broad categories below, we encourage you to register with Accessibility Services:

<https://studentlife.utoronto.ca/department/accessibility-services/>.

- Attention Deficit Hyperactivity Disorder (ADHD)
- Autism Spectrum Disorder
- Brain Injury and Concussion
- Chronic Health
- Deaf and Hard of Hearing
- Learning Disability
- Mental Health
- Mobility and Functional
- Low Vision / Legally Blind
- Temporary Injuries

For any questions or assistance, please see the staff in the Office of the Registrar and Student Services.

**ENGLISH LANGUAGE AND WRITING SUPPORT:**

The University of Toronto expects its students to write well, and it provides resources to help. Please consult the University of Toronto writing site: <https://writing.utoronto.ca/> for advice and answers to your questions about writing. Please pay special attention to "Advice on Writing: Academic Writing."

The Writing Centre at the John H. Daniels Faculty of Architecture, Landscape, and Design (<https://www.daniels.utoronto.ca/students/student-services>) is a resource for Daniels students seeking assistance with academic writing through tutorials and individual consultations.

Academic writing carries with it certain expectations about properly citing, quoting, and referencing source material. Your research must be conveyed in a language commonly shared by others in the discipline. The style guidelines preferred by the Daniels Faculty are put forth in the Chicago Manual of Style and can be found here:

<http://www.chicagomanualofstyle.org/16/contents.html>

[https://owl.purdue.edu/owl/research\\_and\\_citation/chicago\\_manual\\_17th\\_edition/chicago\\_style\\_introduction.html](https://owl.purdue.edu/owl/research_and_citation/chicago_manual_17th_edition/chicago_style_introduction.html)

The Centre for International Experience (CIE) English Language Support is also available to support students: <https://www.studentlife.utoronto.ca/cie/els>



**ACADEMIC INTEGRITY:**

Academic integrity is essential to the pursuit of learning and scholarship in a university, and to ensuring that a degree from the University of Toronto is a strong signal of each student's individual academic achievement. As a result, the University treats cases of cheating and plagiarism very seriously. The University of Toronto's Code of Behaviour on Academic Matters ([www.governingcouncil.utoronto.ca/policies/behaveac.htm](http://www.governingcouncil.utoronto.ca/policies/behaveac.htm)) outlines the behaviours that constitute academic dishonesty and the processes for addressing academic offences. The Code of Behavior on Academic Matters states: "It shall be an offence for a student knowingly [...] to represent as one's own any idea or expression of an idea or work of another in any academic examination or term test or in connection with any other form of academic work, i.e., to commit plagiarism." The Code also states: "Wherever in the Code an offence is described as depending on 'knowing,' the offence shall likewise be deemed to have been committed if the person ought reasonably to have known."

Potential offences include, but are not limited to:

In papers and assignments:

1. Using someone else's ideas or words without appropriate acknowledgement.
2. Submitting your own work in more than one course without the permission of the instructor.
3. Making up sources or facts.
4. Obtaining or providing unauthorized assistance on any assignment.

On tests and exams:

1. Using or possessing unauthorized aids.
2. Looking at someone else's answers during an exam or test.
3. Misrepresenting your identity.

In academic work:

1. Falsifying institutional documents or grades.
2. Falsifying or altering any documentation required by the University, including (but not limited to) doctor's notes.

All suspected cases of academic dishonesty will be investigated following procedures outlined in the Code of Behaviour on Academic Matters. If you have questions or concerns about what constitutes appropriate academic behaviour or appropriate research and citation methods, you are expected to seek out additional information on academic integrity from your instructor or from other institutional resources. For information about academic integrity at the University of Toronto, please see <https://www.academicintegrity.utoronto.ca/>.

Normally, students will be required to submit their course essays to Turnitin.com for a review of textual similarity and detection of possible plagiarism. In doing so, students will allow their essays to be included as source documents in the Turnitin.com reference database, where they will be used solely for the purpose of detecting plagiarism. The terms that apply to the University's use of the Turnitin.com service are described on the Turnitin.com website.

For accepted methods of standard documentation formats, including electronic citation of internet sources please see the U of T writing website at:

<http://www.writing.utoronto.ca/advice/using-sources/documentation>.

Please also refer to "Reading and Using Sources: How Not to Plagiarize" on the University of Toronto writing site (<http://www.writing.utoronto.ca/>).

**Student Work – Daniels Publishing Policy**

On occasion, the John H. Daniels Faculty of Architecture, Landscape, and Design (the Faculty) will share, use, exhibit, display, broadcast, and distribute images of student work completed in this course in connection with the activities of the Faculty for promoting, publicizing, or explaining the activities of the school. Should you wish to 'opt out', please contact

[communications@daniels.utoronto.ca](mailto:communications@daniels.utoronto.ca), otherwise, your participation in this course grants the Faculty permission to publish such images in PR/promotional materials such as marketing, advertising, fundraising, and any other Faculty-related publication. These images may appear in a wide variety of formats including but not limited to social media, website and print.