1. **Course:** CPSC 591: Rendering  
   CPSC 691: Rendering  

   **Lecture Sections:**  
   L01, MWF 11:00-11:50, KNB 133, Usman Alim, MS 636, 220-4362, ualim@ucalgary.ca  
   Office Hours: MW 15:00-16:00  

   **Course Website:** https://d2l.ucalgary.ca/d2l/home/106665  

   **Computer Science Department Office, ICT 602, 220-6015, cpsc@cpsc.ucalgary.ca**

2. **Prerequisites:**  
   CPSC 591: CPSC 453  
   CPSC 691: Consent of the Department  
   (http://www.ucalgary.ca/pubs/calendar/current/computer-science.html#3620)

3. **Grading:** The University policy on grading and related matters is described in sections F.1 and F.2 of the online University Calendar. In determining the overall grade in the course the following weights will be used:

<table>
<thead>
<tr>
<th>CPSC 591</th>
<th>CPSC 691</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>30%</td>
</tr>
<tr>
<td>Midterm Exam</td>
<td>20%</td>
</tr>
<tr>
<td>(In-Class Friday October 30th, 2015)</td>
<td>(In-Class Friday October 31st, 2015)</td>
</tr>
<tr>
<td>Final Project</td>
<td>40%</td>
</tr>
<tr>
<td>Participation</td>
<td>10%</td>
</tr>
</tbody>
</table>

   This course **will not** have a Registrar’s Scheduled Final Exam.

   Each of the above components will be given a letter grade using the official University grading system. The final grade will be calculated using the grade point equivalents weighted by the percentage given above and then reconverted to a final letter grade using the official University grade point equivalents. An A+ will be awarded to those students who qualify for an A and receive an A+ for the course project.

4. **Missed Components of Term Work:** The regulations of the Faculty of Science pertaining to this matter are found in the Faculty of Science area of the Calendar. Section 3.6. It is the student’s responsibility to familiarize themself with these regulations. See also Section E.6 of the University calendar.

5. **Scheduled Out-of-Class Activities:** REGULARLY SCHEDULED CLASSES HAVE PRECEDENCE OVER ANY OUT-OF-CLASS-TIME ACTIVITY. If you have a clash with this out-of-class activity, please inform your instructor as soon as possible so that alternative assignments can be arranged.

6. **Course Materials:**  
   Physically Based Rendering: From Theory to Implementation 2nd Edition, Pharr & Humphreys, *Morgan Kaufmann* 2010 (Required)

   **Online Course Components:** None.

7. **Examination Policy:** A one-sided letter-sized cheat sheet will be permitted for the midterm exam. A basic scientific calculator will also be allowed. Only a calculator, NO cell phones, tablets, smart watches or laptops with calculators on them allowed. Students should also read the Calendar, Section G, on examinations.
8. **Approved Mandatory and Optional Course Supplemental Fees:** None.

9. **Writing across the Curriculum Statement:** In this course, the quality of the student’s writing in the weighted components of the course will be a factor in the evaluation of these components. See also Section E.2 of the University Calendar.

10. **Human Studies Statement:** Students will be expected to participate as subjects or participants in projects. See also Section E.5 of the University Calendar.

11. **OTHER IMPORTANT INFORMATION FOR STUDENTS:**

   a) **Misconduct:** Academic misconduct (cheating, plagiarism, or any other form) is a very serious offense that will be dealt with rigorously in all cases. A single offence may lead to disciplinary probation or suspension or expulsion. The Faculty of Science follows a zero tolerance policy regarding dishonesty. Please read the sections of the University Calendar under Section K, Student Misconduct to inform yourself of definitions, processes and penalties.

   b) **Assembly Points:** In case of emergency during class time, be sure to FAMILIARIZE YOURSELF with the information on assembly points which can be found in each classroom and building.

   c) **Student Accommodations:** Students needing an Accommodation because of a Disability or medical condition should contact Student Accessibility Services in accordance with the Procedure for Accommodations for Students with Disabilities available at [http://www.ucalgary.ca/policies/files/policies/procedure-for-accommodations-for-students-with-disabilities_0.pdf](http://www.ucalgary.ca/policies/files/policies/procedure-for-accommodations-for-students-with-disabilities_0.pdf). Students needing an Accommodation in relation to their coursework or to fulfil requirements for a graduate degree, based on a Protected Ground other than Disability, should communicate this need, preferably in writing, to the Associate Head of Computer Science, Dr. Ben Stephenson, by email [bdstephe@ucalgary.ca](mailto:bdstephe@ucalgary.ca) or phone 403-220-6781.

   d) **Safewalk:** Campus Security will escort individuals day or night ([http://www.ucalgary.ca/security/safewalk/](http://www.ucalgary.ca/security/safewalk/)). Call 403-220-5333 for assistance. Use any campus phone, emergency phone or the yellow phones located at most parking lot pay booths.

   e) **Freedom of Information and Privacy:** This course is conducted in accordance with the Freedom of Information and Protection of Privacy Act (FOIPP). As one consequence, students should identify themselves on all written work by placing their name on the front page and their ID number on each subsequent page. For more information see also [http://www.ucalgary.ca/secretariat/privacy](http://www.ucalgary.ca/secretariat/privacy)

   f) **Student Union Information:** VP Academic (403) 220-3911 [suvpaca@ucalgary.ca](mailto:suvpaca@ucalgary.ca) SU Faculty Rep (403) 220-3913 [science1@su.ucalgary.ca](mailto:science1@su.ucalgary.ca), [science2@su.ucalgary.ca](mailto:science2@su.ucalgary.ca) and [science3@su.ucalgary.ca](mailto:science3@su.ucalgary.ca). Student Ombuds Office: (403) 220-6420 [ombuds@ucalgary.ca](mailto:ombuds@ucalgary.ca), [http://ucalgary.ca/provost/students/ombuds](http://ucalgary.ca/provost/students/ombuds).

   g) **Internet and Electronic Device Information:** You can assume that in all classes that you attend your cell phone should be turned off unless instructed otherwise. All communications with other individuals via laptop computers, cell phones or other devices connectable to the internet in not allowed during class time unless specifically permitted by the instructor. If you violate this policy you may be asked to leave the classroom. Repeated abuse may result in a charge of misconduct.

   h) **U.S.R.I.:** At the University of Calgary feedback provided by students through the Universal Student ratings of Instruction (USRI) survey provides valuable information to help with evaluating instruction, enhancing learning and teaching, and selecting courses ([www.ucalgary.ca/usri](http://www.ucalgary.ca/usri)). Your responses make a difference – please participate in USRI surveys.

Department Approval__________________________________________Date__________________________

Associate Dean’s Approval for
Alternate final examination arrangements:__________________________Date:___________________________

*A signed copy of this document is kept on file in the Computer Science Main Office ICT 602*
This course consists of two parts. In the first part, students will learn the principles behind realistic image synthesis. This part will focus on the theory behind the rendering equation and explore algorithms that numerically solve the rendering equation. The second part will discuss approximations that are motivated by the need to generate images in real-time on modern programmable graphics processing units (GPUs). A major component of the course is a project that students will propose by mid-February and present their findings to the class towards the end of the term.

Tentative Topics for Part I:

1. Preliminaries (1 week)
   Review of Graphics fundamentals, acceleration techniques for intersection tests.

2. Fundamentals of Realistic Image Synthesis (4 weeks)
   Colour and radiometry, camera models, sampling and reconstruction, reflection models.

3. Solving the Rendering Equation (3 weeks)
   Monte Carlo integration, path tracing, irradiance caching, photon mapping, volumetric scattering.

Tentative Topics for Part II:

1. GPUs (1 week)
   GPU Rendering Pipeline, texturing, shading.

2. Approaches to Global Illumination (2 weeks)
   Shadows, ambient occlusion, precomputed light transport.

3. Image-Based Effects (2 weeks)
   Billboarding, depth of field, motion blur.