1. **Course:** CPSC 599.86: Computer Haptics  
   CPSC 601.86 Computer Haptics

   **Lecture Sections:**  
   599: L02, MWF 14:00-14:50, MS 680A, Sonny Chan, MS 634, 210-9474, sonny.chan@ucalgary.ca  
   601: L01, MWF 14:00-14:50, MS 680A, Sonny Chan, MS 634, 210-9474, sonny.chan@ucalgary.ca  
   Office Hours: By Appointment

   **Course Website:**  
   599 website: http://pages.cpsc.ucalgary.ca/~sonny.chan/cpsc599.86/  
   601 website: http://pages.cpsc.ucalgary.ca/~sonny.chan/cpsc601.86/

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

2. **Prerequisites:** 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>Course</th>
<th>Assignments</th>
<th>Presentations</th>
<th>Course Project</th>
<th>Final Exam</th>
<th>Research Comp.</th>
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<tbody>
<tr>
<td>CPSC 599.86</td>
<td>40%</td>
<td>10%</td>
<td>30%</td>
<td>20%</td>
<td></td>
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<tr>
<td>CPSC 601.86</td>
<td>40%</td>
<td>10%</td>
<td>30%</td>
<td>20%</td>
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   **Note:** CPSC 599.86 will have a Registrar’s Scheduled Final Exam. CPSC 699.86 will not.

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 themselves 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:**

   Haptic Rendering, Ming Lin & Miguel Otaduy, *AK Peters* 2008 (Recommended)

   **Online Course Components:** Required readings will include academic publications, which will be made available in electronic form on the course web page.

7. **Examination Policy:** Closed book examination with no aids 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 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, SU Faculty Rep (403) 220-3913 science1@su.ucalgary.ca, science2@su.ucalgary.ca and science3@su.ucalgary.ca. Student Ombuds Office: (403) 220-6420 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*
<table>
<thead>
<tr>
<th>Grade</th>
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<tr>
<td>A-</td>
<td>85-89</td>
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<td>B+</td>
<td>80-84</td>
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<tr>
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<td>75-79</td>
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<tr>
<td>B-</td>
<td>70-74</td>
</tr>
<tr>
<td>C+</td>
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<tr>
<td>C</td>
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<td>C-</td>
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<td>D</td>
<td>40-49</td>
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<tr>
<td>F</td>
<td>0-39</td>
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</tbody>
</table>
Tentative Topics Covered:

Introduction to Computer Haptics
- definition of haptics and computer haptics
- human somaesthetic sense: cutaneous and kinaesthetic perception
- haptic interfaces, historical development, and evolution

Haptic Rendering
- definition of the haptic rendering problem
- force field rendering
- proxy-based rendering algorithms

Collision Detection
- geometric representations of objects: polygonal meshes, implicit surfaces, point sets
- geometry intersection tests
- bounding volume hierarchies
- spatial partitioning strategies

Rendering Dynamic Scenes
- particle physics simulation
- rigid-body dynamics
- deformable body simulation
- considerations for collision detection and proxy-based algorithms

Advanced Haptic Rendering
- friction effects
- textured surfaces
- higher degrees of freedom (6-DOF rendering)
- constraint-based vs. penalty-based contact handling
- quasi-static vs. dynamic proxy simulation

Haptic Interface Design and Control
- internal workings of a kinaesthetic haptic display
- device control strategies and stability considerations