1. **Course:** CPSC 511: Introduction to Complexity Theory  
   CPSC 611: Complexity Theory  
   **Lecture Sections:**  
   L01, MW 14:00-15:15, SA 121, Wayne Eberly, ICT 613, 220-5073, eberly@cpsc.ucalgary.ca  
   Office Hours: MW 15:30-16:30  
   **Course Website:** D2L  
   Computer Science Department Office, ICT 602, 220-6015, cpsc@cpsc.ucalgary.ca

2. **Prerequisites:**  
   CPSC 511: CPSC 413  
   CPSC 611: 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:  
   - **CPSC 511:**  
     - Assignments (4)  
       - 40%  
   - **CPSC 611:**  
     - Assignments  
       - 50%  
     - Project  
       - 50%  
     - **Midterm Test**  
       - 25%  
     - **Final Examination**  
       - 35%  
     - (Monday November 9th, 2015 at 18:00 in SB 142)  
   
   CPSC 511 **will** have a Registrar’s Scheduled Final Exam.  
   CPSC 611 **will not** have a Registrar’s Scheduled Final Exam.

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 theirself 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:**  
     (Recommended)  

   **Online Course Components:** D2L

7. **Examination Policy:** Students will be allowed to bring one double-sided letter-sized page notes into the midterm test and the final examination. No other aids will be 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 out of regular class-time activity: __________________________ 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>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>A+</td>
<td>95-100</td>
</tr>
<tr>
<td>A</td>
<td>90-94</td>
</tr>
<tr>
<td>A-</td>
<td>85-89</td>
</tr>
<tr>
<td>B+</td>
<td>80-84</td>
</tr>
<tr>
<td>B</td>
<td>75-79</td>
</tr>
<tr>
<td>B-</td>
<td>70-74</td>
</tr>
<tr>
<td>C+</td>
<td>66-69</td>
</tr>
<tr>
<td>C</td>
<td>62-65</td>
</tr>
<tr>
<td>C-</td>
<td>58-61</td>
</tr>
<tr>
<td>D+</td>
<td>54-57</td>
</tr>
<tr>
<td>D</td>
<td>50-53</td>
</tr>
<tr>
<td>F</td>
<td>0-49</td>
</tr>
</tbody>
</table>
CPSC 511/611 Syllabus

CPSC 511/611 Course Description: Deterministic and nondeterministic time and space complexity; complexity classes and hierarchies; NP-complete problems and intractable problems.

Topics Covered: This course continues a study of the limits of computation (i.e., a study of what cannot be done using computers) — a significant part of the “theory of computation.”

1. Review of Fundamental Concepts from Computability Theory: The "decidability" (or “computability” theory) introduced at the end of CPSC 313 includes many of the fundamental ideas that are also used in complexity theory — generally in simpler forms. It is therefore useful to begin with a review of this (somewhat simpler) theory.

2. Review of the Theory of NP-Completeness: Results established at the end of CPSC 413 will be presented again in somewhat more detail.

3. Deterministic and Nondeterministic Time-Bounded Complexity Classes Outside NP: The “polynomial hierarchy” and the complexity classes EXPTIME and NEXPTIME will be introduced.

4. Space-Bounded Computation: Complexity classes whose definitions involve the amount of storage space required to solve a problem will also be introduced. These will include classes “inside” P — generally including problems that can be solved using only a logarithmic amount of storage space — as well as classes “outside” P — including problems that can be solved deterministically, or nondeterministically, using a polynomial (or, even, exponential) amount of storage space.

5. Complexity Classes for Alternative Modes of Computation: Significant results concerning classes for which a “circuit” is the machine model, instead of a Turing machine or random access machine, are important because of the results that can be proved using them. Complexity classes that are defined for randomized computation, and for parallel computation, will also be introduced and studied.

This will likely take up most, or even all, of the term. However, there are additional topics that might be studied — including complexity classes appropriate for quantum computation, as well as “interactive” computation (something that has applications in computer security). These might be studied if time permits.