1. **Course:** CPSC 601.15: Interactive Visualization and Analytics of Reservoir Simulation Post Processing Studies

   **Lecture Sections:**
   L06, MWF 11:00-11:50, Mario Costa Sousa, MS 628, 220-6783, smcosta@ucalgary.ca

   **Office Hours:** By Appointment

   **Course Website:** [http://www.cpsc.ucalgary.ca/~mario/courses/W16/CPSC601.15](http://www.cpsc.ucalgary.ca/~mario/courses/W16/CPSC601.15)

2. **Prerequisites:** Consent of the Department. ([http://www.ucalgary.ca/pubs/calendar/current/computer-science.html#3620](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:

   - Project: 55%
   - Paper Reading, Critique and Presentations: 45%

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

   Special Regulations affecting the Final Grade: 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.

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:** Selected book, course notes, journal articles and conference papers.

   **Online Course Components:** None.

7. **Examination Policy:** Not applicable. 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:** See 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__________________________

*A signed copy of this document is kept on file in the Computer Science Main Office ICT 602*
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Tentative Topics Covered:

- **Reservoir Geoscience & Engineering:**
  Background, techniques and technologies, workflows.

(1) **Data modelling & knowledge representation**
  (1.1) Interactive data modelling (i.e. techniques for visually constructing and editing the geometry and topology of 2D and 3D reservoir models) and knowledge representation (i.e. techniques to visually encode interpretive and analytical reasoning in the reservoir data modelling process), both facilitated by interactive visual interfaces.
  (1.2) Scalable data management frameworks, handling the exponential increase in the volume of industry data, enabling information handling and analysis via different modalities, spatial densities and scales.

(2) **Data visualization & analytics**
  (2.1) Interactive data visualization (i.e. techniques for visualizing 2D, 3D and high-dimensional reservoir data and models) and analytics (i.e. analytical reasoning about the reservoir data), both facilitated by interactive visual interfaces.
  (2.2) Integrated visualization & visual analytics techniques, establishing a coherent workflow through complex processes, indicating the level of uncertainty in a range of features, visually highlighting data interpretations as well as anomalies.

(3) **Data interaction techniques & technologies**
  (3.1) Determine the appropriate visual interaction and representation of the information for the user, their experience and their role/task. The nature of interactions (e.g. collaborative, remote interactions etc.) also demands the need for using various technologies that can better suit the task needs. We focus on R&D of novel user interaction techniques and technologies to address these challenges.

This course will focus on key issues and requirements for R&D of visual computing applied to reservoir geoscience and engineering, including:

- Provide visual representations and analytics that reflect and express the available information, the level of uncertainty and visualization requirements for processes at different stages of exploration, development and production (E, D&P)
- Link static and dynamic reservoir modelling, visualization and analytics reflecting on all E, D&P stages;
- Improve communication between users involved in field development and decision-making;
- Guide complex processes reflecting and expressing the level of data uncertainty during interactive model building, interpretive visualization and analysis of reservoir datasets;
- Leverage of existing work processes, expressing the level of uncertainty over a range of features from visual anomalies to detailed interpretations and reservoir dynamics.