THE UNIVERSITY OF WINNIPEG

APPLIED COMPUTER SCIENCE

Course Number - GACS-7401-001
Course Name – Current Topics in Computing (Complex Adaptive Systems)

Instructor Information

Instructor:	**Prof. Sergio G. Camorlinga**	**Office:**	3D29
E-mail:	s.camorlinga@uwinnipeg.ca	**Office Hours:** Th: 16:00 - 17:00 p.m.	
		or by email appointment	

Class Meeting Time: Tu, Th: 14:30 pm – 15:45 pm   **Room No:** 3D03
Course Web Page: https://courses.acs.uwinnipeg.ca/7401-001
Instructor's Home Page: https://www.acs.uwinnipeg.ca/scamorlinga

Important Dates

First Class:	Tu Sep 5th, 2017
Reading Week (no classes)	Su Oct 8th – Sat Oct 14th, 2017
Midterm Exam:	Tu Oct 24th, 2017
Final Withdrawal Date w/o academic penalty:	Tu Nov 10th, 2017

(A minimum of 20% of the work on which the final grade is based will be evaluated and available to the student before the voluntary withdrawal date)

Last Class:	Th Nov 30th, 2017

Course Objectives/Learning Outcomes

This course is an introduction to selected topics in the field of Complex Adaptive Systems (CAS) and its application to social and health systems. CAS are systems with many members, which are interacting, adapting and learning among themselves and the environment where they exist in a variety of ways. Because of these activities, novel properties for the system can emerge. Samples of CAS are everywhere and diverse, for instance our brains, immune systems, insect colonies, ecosystems, communities, geopolitical organizations, social systems, internet, etc. We will go over fundamental topics of complexity, cellular automata, dynamical systems, genetic algorithms, immune systems, and artificial life. Then we will apply these ideas to social and health systems. We will utilize computational tools to measure, simulate and analyze complexity in a variety of CAS. Theory and simulations will provide us some level of understanding for CAS and a methodology to better manage CAS and their interrelationships.

Evaluation Criteria

- Assignments: 10%
  - There will be 4 assignments worth 2.5% each.
    - May include theory, programming and/or analysis exercises
  - Due at the beginning of class on due dates.
  - No late assignment will be accepted, or under special circumstances accepted with 20% off for each late day.
  - Assignments should be hand in by due date on paper (no handwritten) unless email submission is requested. Handwritten assignments will not be accepted.
  - Multiple submissions are not permitted. Students may submit a partially completed assignment, and will receive credit for those attempted problems.
  - If electronic hand in is requested, students are responsible to review their assignments before submission to make sure the correct files are attached to the email.

- Paper Presentations: 10%
  - There will be 2 paper presentations per student
  - Each presentation is worth 5% each
  - PowerPoint slides should be used for the presentation

- Final Project: 60%
  - Two phases
    - Project description (5%)
    - Final project report plus source code (55%)

- Midterm Exam: 20%
  - Closed-book midterm exam

Exam Requirements
- Photo ID at exam is required.
- You are expected to write the test/exam on its given day.
- No electronic devices (e.g. cell/smart phone, laptop, scientific calculators, translators, etc.) are permitted.
- Simple calculators can be used though. Simple calculators are subjected to test and can be denied use at mid-term test and final examination times.
- Unless a medical certificate is provided, no accommodation is made for missed exams.

Final Letter Grade Assignment

Historically, numerical percentages have been converted to letter grades using the following scale. However, instructors can deviate from these values based on pedagogical nuances of a particular class, and final grades are subject to approval by the Department Review Committee.

A+	90+ - 100%	B+	75 - 79%	C	60 - 64%
A	85 - 90%	B	70 - 74%	D	50 - 59%
A-	80 - 84%	C+	65 - 69%	F	below 50%

Email Communication

Emails from accounts at uwinnipeg.ca are usually not filtered by the UofW email filter. Thereby it is recommended electronic communication used for the course utilize a UofW email account to minimize the risk of filtering.

Services for Students

Students with documented disabilities, temporary or chronic medical conditions, requiring academic accommodations for tests/exams (e.g., private space) or during lectures/laboratories (e.g., note-takers) are encouraged to contact Accessibility Services (AS) at 786-9771 or accessibilityservices@uwinnipeg.ca to discuss appropriate options. All information about a student's disability or medical condition remains confidential http://www.uwinnipeg.ca/accessibility .

Students may choose not to attend classes or write examinations on holy days of their religion, but they must notify their instructors at least two weeks in advance. Instructors will then provide opportunity for students to make up work examinations without penalty. A list of religious holidays can be found in the 2017-18 Undergraduate Academic Calendar.

All students, faculty and staff have the right to participate, learn, and work in an environment that is free of harassment and discrimination. The UW Respectful Working and Learning Environment Policy may be found online at www.uwinnipeg.ca/respect .

Misuse of Computer Facilities, Plagiarism, and Cheating

Academic dishonesty is a very serious offense and will be dealt with in accordance with the University's policies. Be sure that you have read and understood Regulations & Policies #9, in the 2017-2018 UW Graduate Studies Academic Calendar available at https://www.uwinnipeg.ca/academics/graduate-calendar/docs/grad-regandpols.pdf

Additional information is available at University of Winnipeg library video tutorial "Avoiding Plagiarism" https://www.youtube.com/watch?v=UvFdxRU9a8g

Text Book(s) / Reading List

There is no textbook suitable for the course contents, however we will use the following books as guides, supplemented with readings and other books throughout the course.

- Complexity: A Guided Tour
  Mitchell, Melanie
  Oxford University Press, 2009 Edition
  ISBN 978-0-19-512441-5

- Complex Adaptive Systems: An Introduction to Computational Models of Social Life
  Miller John H. & Page Scott E.
  Princeton University Press, 2007 Edition
  ISBN 978-0-691-13096-5 (acid-free paper) / 978-0-691-12702-6 (pbk: acid-free paper)
- Introduction to the Modeling and Analysis of Complex Systems
  Hiroki, Sayama
  Open Suny Textbooks, 2015 Edition
  ISBN 978-1-942341-08-6 (paper) / 978-1-942341-09-3 (ebook)

Prerequisite and Restriction Information[*]

(This information can be found in the UW Graduate Academic Calendar)
- Prerequisites: Consent of the Department Graduate Program Committee Chair or Instructor

Course Outline (Tentative)

I. CAS Introduction
- Complexity, emergence, self-organization
- Dynamics, chaos and prediction, fractals
- Information, computation and evolution

II. Fundamental Concepts
- Modeling
- Agent-based objects
- Genetic algorithms
- Cellular automata
- Dimensionality and scaling

III. Selected CAS Topics
- Artificial life
- Computational immunology
- CAS in social systems
- CAS in health systems
- Open agenda for future works

Note that all topics listed may not be covered and may be offered in a slightly different time order.

Additional Course Related Information

1. When it is necessary to cancel a class due to exceptional circumstances, instructors will make every effort to inform you via uwinnipeg email, as well as the departmental assistant and Chair/Dean so that class cancellation forms can be posted outside classrooms.

2. Your uwinnipeg email address will normally be used for course related correspondence.

3. Please note that withdrawing before the VW date does not necessarily result in a fee refund.

4. April 5, 2018 is the class make-up date for courses that conflict with Good Friday, March 30.

5. No classes: Oct. 8 – 14 Mid-term reading week; Feb. 18-24 Winter Mid-term reading week; Friday, March 30 (Good Friday).