Graduate Studies in Computer Science
Course Listing – Winter 2021

Course	Course Name	Professor	Schedule	Room
CP8202	**Advanced Software Engineering**	Dr. V. Misic	**Wednesday 15:00-18:00**	Virtual
CP8204	**Advanced Programming Languages**	Dr. J. Doliskani	**Friday 14:00-16:00 Monday 14:00-15:00 Thursday 11:00-12:00**	Virtual
CP8207	**Special Topics: Core Computer Sci Topic: Advanced Natural Language** *(FOR STUDENTS IN THE MSc PROGRAM)*	Dr. V. Hu	**Wednesday 09:00-12:00**	Virtual
CP8301	**Secure Computing**	Dr. A. Miri	**Monday 15:00-18:00**	Virtual
CP8307	**Introduction to Computer Vision**	Dr. K. Derpanis	**Tuesday 12:00-15:00**	Virtual
CP8310*	**Directed Studies in Computer Science**	N/A	N/A	
CP8312*	**Directed Studies: Intelligence and Robotics**	N/A	N/A	
CP8313*	**Directed Studies: Networks**	N/A	N/A	
CP8315	**Special Doctoral Topics - AI & R Topic: Advanced Natural Language** *(FOR STUDENTS IN THE PhD PROGRAM)*	Dr. V. Hu	**Wednesday 09:00-12:00**	Virtual
CP8317	**Performance Evaluation**	Dr. J. Misic	**Monday 09:00-12:00**	Virtual
CP8319	**Reinforcement Learning**	Dr. N. Farsad	**Thursday 16:00-18:00 Tuesday 08:00-09:00**	Virtual
CP8320	**Program Analysis for Cyber Security**	Dr. M. Alalfi	**Thursday 09:00-12:00**	Virtual
CP8322	**Deep Learning in Computer Vision**	Dr. K. Derpanis	**Friday 12:00-15:00**	
CP9102*	**Doctoral Seminar**	Dr. I. Woungang	**Monday 12:00-13:00**	Virtual

* Requires a Directed Studies / Restricted Courses Request Form for enrollment, available at https://www.ryerson.ca/cs/graduate/

Notes:

1. Winter classes begin Friday, January 15, 2021.

2. Refer to the Significant Dates for course ADD and DROP deadlines:

https://www.ryerson.ca/graduate/calendar/significant-dates/

3. See the Graduate Calendar for Program Curriculum and Course Descriptions:

https://www.ryerson.ca/graduate/calendar/programs-and-courses/

Course Descriptions

CP8202 Advanced Software Engineering
Modern approaches to software development are studied including requirements analysis, system design techniques, formal description techniques, implementation, testing, debugging, metrics, human factors, quality assurance, cost estimation, maintenance, and tools. 1 Credit

CP8204 Advanced Programming Languages
A study of the principles, concepts, and mechanisms of computer programming languages - their syntax, semantics, and pragmatics; the processing and interpretation of computer programs; programming paradigms; and language design. Additional topics will include language design principles and models of language implementation. 1 Credit.

CP8207 Special Topics: Core of Computer Science
This special topics course examines selected, advanced topics in areas related to the core areas of computer science series that are not covered by existing courses. The topic(s) will vary depending on the need and the instructor. 1 Credit
Topic for Winter 2021: Advanced Natural Language: This course will prepare students for graduate-level research in natural language processing, and give them the background to qualify for academic research and job opportunities in industry. It will also be useful for students interested in working with textual data in other fields from a computational science perspective.

Natural Language Processing addresses fundamental questions at the intersection of human languages and computer science. How can computers acquire, comprehend and produce English? How can computational methods give us insight into observed human language phenomena? In this advanced NLP course, the students will learn how computers can do useful things with human languages, such as translate from French into English, filter junk email, extract social networks from the web, and find the main topics in the day's news. The students will also learn about how computational methods can help linguists explain language phenomena, including automatic discovery of different word senses and phrase structure.

CP8301 Secure Computing
The importance of security for computer systems: protection, access control, distributed access control, Unix security, applied cryptography, network security, firewalls, secure coding practices, safe languages, mobile code. Computer and network forensics techniques. Computer security techniques. Legal and Ethical issues. Topics may include cryptographic protocols, privacy, anonymity, and/or other topics as time permits. 1 Credit

CP8307 Introduction to Computer Vision
This course describes foundational concepts of computer vision. In particular, the course covers the image formation process, image representation, feature extraction, model fitting, motion analysis, 3D parameter estimation and applications. 1 Credit

CP8310 Directed Studies in Computer Science
This course is for Master's students who wish to gain knowledge in a specific area for which no graduate level classes are offered. Students wishing to take the class would be assigned a suitable class advisor most familiar with the specific area of interest. Students are required to present the work of one term (not less than 90 hours in the form of directed research, tutorials and individual study) in an organized format. 1 Credit
Not available to Course option students. Only one of CP8310 and CP8215 may be taken for credit toward degree completion.

CP8312 Directed Studies: Intelligence and Robotics
This course explores theoretical, practical and experimental (if applicable) problems in great depth in the areas of intelligence and robotics with emphasis on the aspects of Intelligence and Robotics and their application related to the discipline of Computer Science. Doctoral students must present their findings in a formal report. 1 Credit.

CP8313 Directed Studies: Networks
This course explores theoretical, practical and experimental (if applicable) problems in great depth in areas of computer and communication networks with emphasis on the aspects of computer networking and its application related to the discipline of Computer Science. Doctoral students must present the findings in a formal report. 1 Credit

CP8315 Special Doctoral Topics: AI & Robotics
This special topics course will present material that is not currently part of the regular computer science doctoral program but are of interest to faculty and students in the field of Artificial Intelligence and Robotics. 1 Credit.
Topic for Winter 2021: Advanced Natural Language: This course will prepare students for graduate-level research in natural language processing, and give them the background to qualify for academic research and job opportunities in industry. It will also be useful for students interested in working with textual data in other fields from a computational science perspective.

Natural Language Processing addresses fundamental questions at the intersection of human languages and computer science. How can computers acquire, comprehend and produce English? How can computational methods give us insight into observed human language phenomena? In this advanced NLP course, the students will learn how computers can do useful things with human languages, such as translate from French into English, filter junk email, extract social networks from the web, and find the main topics in the day's news. The students will also learn about how computational methods can help linguists explain language phenomena, including automatic discovery of different word senses and phrase structure.

CP8317 Performance Evaluation
Probability Theory; Transforms of probability distributions; Branching processes; Discrete time Markov Chains; Continuous time Markov Chains; Birth-Death processes ; Intermediate queuing theory, M/G/1 queues ; Renewal theory; Gated and limited systems; Hidden Markov model. 1 Credit.

CP8319 Reinforcement Learning
This course focuses on topics related to reinforcement learning. The course will cover making multiple-stage decisions under uncertainty, heuristic search in planning, Markov decision processes, dynamic programming, temporal-difference learning including Q-learning, Monte Carlo reinforcement learning methods, function approximation methods, and the integration of learning and planning. 1 Credit.

CP8320 Program Analysis for Cyber Security
This course will focus on Language-Based Security, an area of research that studies how to enforce application-level security using program analysis techniques. This includes techniques used to automate the detection\prevention of security vulnerabilities caused by coding malpractice or security-policy misconfigurations; the study of the design and implementation of secure programming languages; and techniques used to enforce correct usage of security Application Programming Interfaces. 1 Credit

CP8322 Deep Learning in Computer Vision
Computer vision is broadly defined as the study of recovering useful properties of the world from one or more images. In recent years, deep learning, an expansive term covering trainable, hierarchical network architectures, has emerged as a central tool for addressing computer vision tasks. This course will cover a range of topics at the intersection of deep learning and computer vision, including object recognition, object detection, and video understanding. 1 Credit

CP9102 Doctoral Seminar
The purpose of the Doctoral Seminar is to provide students exposure to the latest research, issues and findings related to the discipline of Computer Science. The seminar will consist of invited guests and talks by experts from industry, academia and graduate students themselves. Students will have an opportunity to improve their writing and critical thinking skills through assigned work associated with the seminar topics. All students are required to attend and actively participate in seminars every semester for a total of six semesters. A doctoral candidate must give two publicly announced research seminars on his/her thesis research. The student's supervisor(s) and at least one other member of the student's Dissertation Supervisory Committee must attend this seminar. The quality of the student's presentation will be graded on a Pass/Fail basis. Each student will be required to pass each research seminar presentation. Pass/Fail