ECE 7650: APPLIED COMPUTATIONAL INTELLIGENCE
COURSE OUTLINE
SUMMER 2015

COURSE DESCRIPTION:
This course applies computationally intelligent algorithms to solve difficult computer engineering and computer science problems. This course consists of the following components: standard lecture delivery, hands-on, and project based. The theory of several computationally intelligent algorithms will be presented in class. Along with receiving the theory in class, students are required to demonstrate their understanding by implementing the algorithms in software to solve given difficult engineering problems, which have shown to be intractable with the application of conventional algorithms. Students will present the results of their projects in class to compare and contrast the pros and cons of each applied algorithm.

COURSE OBJECTIVE:
This course has the following objectives:
1. To understand the state-of-the-art computationally intelligent algorithms.
2. To apply the given computationally intelligent algorithms to intractable computer engineering and computer science problems.
3. To gain experience in writing software.
4. To learn how to present and compare results of research work.

PRE-REQUISITES:
This course has the following pre-requisites:
- Software languages in C, Java, and Matlab.

CONTACT HOURS:
An equivalent of 3 lectures /week (3 credit hours).

COURSE CONTENT:
This course has the following content:
1. Introduction to machine learning.
2. Linear and logistic regression.
5. Artificial Neural Network (ANN).
7. Particle Swarm Optimization (PSO)
8. Ant Colony Optimization (ACO).
9. Data Sets.

PAPER REVIEWS AND SEMINARS:
A student is required to review and give a presentation for one graduate-level research paper. Students will be assigned papers to present approximately one week in advance of the presentation date. The format of the presentation will be given in the course notes.

PROJECTS:
Students are required to do four projects in this course. Each project will apply a chosen computationally intelligent algorithm to solve a given difficult computer engineering and computer science problem. The results of each algorithm will be compared and contrasted to determine its relative effectiveness to solve the given problem.
TEXTBOOK:
This course provides online lecture notes and list of papers.

EVALUATION:
Your final course grade is determined by your performance in assignments, term test, and a final examination. The weighting of each of these components is as follows:

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<th>COMPONENT</th>
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<th>TOTAL VALUE</th>
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<tr>
<td>Seminar</td>
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INSTRUCTOR INFO:
Prof. K. Ferens, Ph.D., P.Eng.
E1-544
474-8517
Ken.Ferens@umanitoba.ca

OFFICE HOURS:
TBA.

VOLUNTARY WITHDRAW:
TBA, 2014

REQUIREMENTS/REGULATIONS
- **Student Responsibilities**: It is the responsibility of each student to contact the instructor if he/she is uncertain about his/her standing in the course and about his or her potential for receiving a failing grade. Students should also familiarize themselves with Sections 4 and 6 of the Regulations dealing with incomplete term work, deferred examinations, and attendance and withdrawal. Attendance at lectures is essential for successful completion of this course. Students must satisfy each evaluation component in the course.

ACADEMIC INTEGRITY:
Students are expected to conduct themselves in accordance with the highest ethical standards of the Profession of Engineering and evince academic integrity in all their pursuits and activities at the university. As such, in accordance with the General Academic Regulations and Requirements of the University of Manitoba, Section 7.1, students are reminded that **plagiarism* or any other form of cheating** is subject to serious academic penalty (e.g. suspension or expulsion from the faculty or university) regardless of media

- examinations
- assignments
- laboratory reports
- term exams

A student found guilty of contributing to cheating in examinations or term assignments is also subject to serious academic penalty

**Plagiarism**: to steal and pass off (the ideas or words of another) as one's own; use (another's production) without crediting the source.