1 Name, Scope and Level of the Course
The course is provided by the University of Skövde and is named Computational Intelligence A1N. It comprises 6 credits and is on advanced level. The level of progression of the course is A1N.

2 Objectives
After completed course the student should be able to:

- describe various computational intelligence methodologies and discuss the advantages and shortcomings of each,
- mathematically formulate problems to be solved using these methodologies,
- understand the effect of parameters and tune them to improve performance of the methods,
- apply machine learning algorithms various datasets,
- identify problem types and recommend methods that can be used,
- write computer programs for implementing some of the methodologies,
- use software tools, online programming libraries and source codes to quickly solve problems and
- read, understand and explain research articles concerning soft computing.

3 Course Content
Computational Intelligence (CI) deals with methods and algorithms intended to solve NP-hard problems. Many problems in the real-world are ill-posed and therefore cannot be efficiently solved using deterministic methods. CI methodologies can be broadly classified into neuro, fuzzy and evolutionary techniques. These techniques emulate natural and biological systems to find approximate solutions in a reasonable time. CI also has a significant overlap with the fields of artificial intelligence and data-mining, where the focus is on discovering patterns and knowledge from data through machine learning.

This course will firstly introduce methodologies which fit the traditional definition of CI, namely: Artificial Neural Networks, Fuzzy Computation and Evolutionary Computation.

We will also learn to apply selected topics in machine learning, namely: supervised learning which includes Classification and regression trees, k-Nearest Neighbors, Neural Networks and Random Forests and Unsupervised learning which includes k-Means and Hierarchical Clustering.

Desirable Prerequisites are basic knowledge of vector and matrix operations and programming knowledge.

4 Forms of Teaching
The teaching comprises lectures, supervision, laboratory sessions, project work, presentations and seminars/group discussions.
The teaching is conducted in English.

5 Examination
The course is graded A (Excellent), B (Very good), C (Good), D (Satisfactory), E (Sufficient) or F (Fail).

Registration of examination results:

<table>
<thead>
<tr>
<th>Name of examination</th>
<th>Credits</th>
<th>Grading</th>
</tr>
</thead>
<tbody>
<tr>
<td>Written assignment</td>
<td>2 credits</td>
<td>G/U</td>
</tr>
<tr>
<td>Laboratory assignment</td>
<td>1 credits</td>
<td>G/U</td>
</tr>
<tr>
<td>Seminar assignment</td>
<td>1 credits</td>
<td>G/U</td>
</tr>
<tr>
<td>Project presentation¹</td>
<td>2 credits</td>
<td>A/B/C/D/E/F</td>
</tr>
</tbody>
</table>

¹ Determines the final grade of the course.

Students with a permanent disability who have been approved for special educational support may be offered adapted or alternative examinations.

6 Admission Requirements
The prerequisite for this course are a Bachelor degree of at least 180 higher education credits (equivalent to 180 ECTS) within the fields of integrated product development or production engineering or automation engineering or mechanical engineering or information technology or similar.

A further requirement is proof of skills in English equivalent of studies at upper secondary level in Sweden, known as English course 6 / English course B. This is normally demonstrated by means of an internationally recognized test, e.g. IELTS or TOEFL or the equivalent.

7 Subject, Main Field of Study and Disciplinary Domain
The course forms a part of the academic subject area of Virtual Product Realization. The course is a part of the main field of study in Virtual Product Realization at the University of Skövde. The course can also be a part of the main field of study in Informatics. The disciplinary domain of the course is Technology.

Every course at the University of Skövde belongs to a subject. The division of subjects is used for follow-up and quality assurance. A main field of study is an area in which a degree can be awarded. Disciplinary domain is a division which is used by the government for the allocation of resources for studies at basic level and advanced level.

8 Approval of Course and Course Syllabus
The course was approved by the Curriculum Committee for Engineering Science on 5 February 2018. This course syllabus was approved by the Curriculum Committee for Engineering Science on 5 February 2018. It is valid from 1 July 2018.

9 Overlapping with Another Course
This course cannot constitute a part of a degree also containing a course the content of which is totally or partly equivalent to the content of this course.

10 Additional Information
Further information will be available on the university’s website before a course is given.

National and local regulations for higher education are available on the university’s website.

Upon completion of the course there will be a follow-up. The main purpose of this follow-up is to contribute to improvements of the course. The students’ experiences and views constitute one of the criteria for the follow-up and are gathered by means of course evaluations. The students will be informed of the results of the follow-up and any decisions regarding actions that are to be taken.

11 Course Literature and Other Educational Materials
Sunith B. Compendium: Computational Intelligence. University of Skövde.

Reference literature

