



**Course Specification**

**Course Name:** [Computational Intelligence in Operations Research and Decision Support ]  
**Course Code:** DS351

**I. Basic Course Information**

Major or minor element of program: Both Major and Minor  
Department offering the course: Operations Research and Decision Support Department

Academic level: Level 300  
Semester in which course is offered: Second (spring) Semester  
Course pre-requisite(s): [Introduction to Systems and Decision Support DS211 ]

Credit Hours:3  
Contact Hours Through:

Lecture	Tutorial*	Practical*	Total
2.5	1.5	0.0	4.0

\* 1.5 hours for **either** Tutorial or Practical

Approval date of course specification:[January 2015]

**II. Overall Aims of Course**

[This course will cover the three main components of the field of Computational Intelligence: namely Evolutionary, Fuzzy, and Neural Computation. An emphasis will be made on the application of Computational Intelligence (CI) techniques to optimization, prediction and modeling. Related heuristic techniques such as Ant Algorithms, Tabu search, Simulated Annealing may also be covered. The advantages and limitations as well as the guidelines for selecting the most efficient approach for various types of problems will be addressed. The implementation of CI techniques for various problems will be stressed throughout the course. ]

**III. Program ILOs covered by course**

Program Intended Learning Outcomes (By Code)			
Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
[K16,K17,K23 ]	[I12,I13 ]	[P3,P12,P13 ]	[G2,G4,G9 ]



## Course Specification

### IV. Intended Learning Outcomes of Course (ILOs)

#### a. Knowledge and Understanding

On completing the course, students should be able to:

- K.1 [Demonstrate optimization problems and evolutionary computation.
- K.2 Know Classification and Regression problems in the context of neural computation.
- K.3 Explain Heuristic search techniques and how they relate to the CI rubric. ]

#### b. Intellectual/Cognitive Skills

On completing the course, students should be able to:

- I.1 [Map algorithm design to code.
- I.2 Evaluate the problems associated with visualizing and presenting algorithm performance. ]

#### c. Practical/Professional Skills

On completing the course, students should be able to:

- P.1 [Learn to enhance your visualization.
- P.2 Implement complex algorithm.
- P.3 Write programs by Java or python. ]

#### d. General and Transferable Skills

On completing the course, students should be able to:

- G.1 [Write reports effectively.
- G.2 Work in teams.
- G.3 Acquire problem solving skills. ]

### V. Course Matrix Contents

	Main Topics / Chapters	Duration (Weeks)	Course ILOs Covered by Topic (By ILO Code)			
			K & U	I.S.	P.S.	G.S.
1-	[Motivation and Background to CI ]	[1 ]	[K1 ]	[I2 ]	[P1 ]	[ ]
2-	[Evolutionary Computation ]	[4 ]	[K1 ]	[I2 ]	[All ]	[All ]
3-	[Neural Computation ]	[4 ]	[K2 ]	[I1,I2 ]	[All ]	[All ]
4-	[Heuristic Approaches and Ant Colony Optimization ]	[2 ]	[K2 ]	[I1,I2 ]	[All ]	[All ]
5-	[Fuzzy Logic ]	[2 ]	[K3 ]	[I1,I2 ]	[All ]	[All ]
	<b>Net Teaching Weeks</b>	<b>13</b>				



Course Specification

VI. Course Weekly Detailed Topics / hours / ILOs

Week No.	Sub-Topics	Total Hours	Contact Hours	
			Theoretical Hours	Practical Hours*
1	Motivation and Background to CI	2.5	2.5	
2	Evolutionary Computation	4	2.5	1.5
3	Evolutionary Computation	4	2.5	1.5
4	Evolutionary Computation	4	2.5	1.5
5	Evolutionary Computation	4	2.5	1.5
6	Neural Computation	4	2.5	1.5
7	<b>Midterm Exam3</b>			
8	Neural Computation	4	2.5	1.5
9	Neural Computation	4	2.5	1.5
10	Neural Computation	4	2.5	1.5
11	Heuristic Approaches and Ant Colony Optimization	4	2.5	1.5
12	Heuristic Approaches and Ant Colony Optimization	4	2.5	1.5
13	Fuzzy Logic	4	2.5	1.5
14	Fuzzy Logic	4	2.5	1.5
15	<b>Final Exam</b>			
<b>Total Teaching Hours</b>		<b>51</b>	<b>33</b>	<b>18</b>

\*No Practical/Tutorial during the first week of the semester

VII. Teaching and Learning Methods

Teaching/Learning Method	Selected Method	Course ILOs Covered by Method (By ILO Code)			
		K & U	Intellectual Skills	Professional Skills	General Skills
Lectures & Seminars	<input checked="" type="checkbox"/>	[K1, K2, K3]	[I2]	[All]	[All]
Tutorials	<input type="checkbox"/>	[ ]	[ ]	[ ]	[ ]
Computer lab Sessions	<input type="checkbox"/>	[ ]	[ ]	[ ]	[ ]
Practical lab Work	<input checked="" type="checkbox"/>	[ ]	[I1]	[P2]	[G1]
Reading Materials	<input type="checkbox"/>	[ ]	[ ]	[ ]	[ ]
Web-site Searches	<input type="checkbox"/>	[ ]	[ ]	[ ]	[ ]
Research & Reporting	<input checked="" type="checkbox"/>	[K1, K2, K3]	[ ]	[ ]	[G2]
Problem Solving / Problem-based Learning	<input type="checkbox"/>	[ ]	[ ]	[ ]	[ ]
Projects	<input type="checkbox"/>	[ ]	[ ]	[ ]	[ ]
Independent Work	<input type="checkbox"/>	[ ]	[ ]	[ ]	[ ]
Group Work	<input type="checkbox"/>	[ ]	[ ]	[ ]	[ ]
Case Studies	<input type="checkbox"/>	[ ]	[ ]	[ ]	[ ]
Presentations	<input type="checkbox"/>	[ ]	[ ]	[ ]	[ ]
Simulation Analysis	<input type="checkbox"/>	[ ]	[ ]	[ ]	[ ]
Others (Specify):	<input type="checkbox"/>	[ ]	[ ]	[ ]	[ ]



Course Specification

VIII. Assessment Methods, Schedule and Grade Distribution

Assessment Method	Selected Method	Course ILOs Covered by Method (By ILO Code)				Assessment Weight / Percentage	Week No.
		K & U	I.S.	P.S.	G.S.		
Midterm Exam	[✓]	[K1,K2,K3]	[I2]	[P1]	[ ]	[20%]	7
Final Exam	[✓]	[K1,K2,K3]	[I2]	[ ]	[ ]	60%	15
Quizzes	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Course Work	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Report Writing	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Case Study Analysis	[ ]	[ ]	[ ]	[P1]	[ ]	[ ]	[ ]
Oral Presentations	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Practical	[✓]	[ ]	[I1,I2]	[All]	[All]	[20%]	[On a weekly basis]
Group Project	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Individual Project	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Others (Specify):	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]

IX. List of References

<b>Essential Text Books</b>	<ul style="list-style-type: none"> <li>[Andries P. Engelbrecht, Computational Intelligence: An Introduction, Wiley 2002]</li> </ul>
<b>Course notes</b>	<ul style="list-style-type: none"> <li>[Power point Slides]</li> </ul>
<b>Recommended books</b>	<ul style="list-style-type: none"> <li>[Z. Michalewicz and David Fogel, How to Solve it: Modern Heuristics. Springer 1999]</li> </ul>
<b>Periodicals, Web sites, etc ...</b>	<ul style="list-style-type: none"> <li>[<a href="http://groups.yahoo.com/group/or481">http://groups.yahoo.com/group/or481</a>]</li> </ul>

X. Facilities required for teaching and learning

<p>List the facilities required</p> <ul style="list-style-type: none"> <li>• Computer Projector</li> <li>• Computer Labs.</li> </ul>
--

**Course coordinator:** Ass.Prof. Mohammed El-Beltagy

**Head of Department:** Prof. Mohamed Mostafa Saleh

**Date:** [January 2015]