



**University/Academy:** Arab Academy for Science and Technology & Maritime Transport  
**Faculty/Institute:** College of Computing and Information Technology  
**Program:** Computer Science

**Form No. (12)**  
**Course Specification**

**1- Course Data**

<b>Course Code:</b> CS464	<b>Course Title:</b> Soft Computing	<b>Academic Year/Level:</b> Year 4 / Semester 7
<b>Specialization:</b> Computer Science	<b>No. of Instructional Units:</b> 2 hrs lecture 2 hrs lab	<b>Lecture:</b>

<b>2- Course Aim</b>	This course introduces soft computing methods which, unlike hard computing, are tolerant of imprecision, uncertainty and partial truth. The principal constituents of soft computing are fuzzy logic, neural network theory, support vector machines, swarm intelligence and genetic algorithms.
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**3- Intended Learning Outcome:**

<b>a- Knowledge and Understanding</b>	<b>Students will be able to demonstrate knowledge of:</b>  <b>K10.</b> Current developments in computing and information research. <b>K15.</b> Interpret and analyzing data qualitatively and/or quantitatively. <b>K19.</b> Select advanced topics to provide a deeper understanding of some aspects of the subject, such as hardware systems design, object-oriented analysis and design, and artificial intelligence, and parallel and concurrent computing. <ol style="list-style-type: none"><li>1. Know the difference between soft computing and hard computing</li><li>2. Know the standard genetic algorithm procedure,</li><li>3. Know different operators of genetic algorithm</li><li>4. Identify different problem encoding</li><li>5. Know the standard genetic programming procedure,</li><li>6. Know the standard evolutionary strategies procedure,</li><li>7. Understand Threshold logic unit</li><li>8. Know perceptron model</li><li>9. know the creation of arrays</li><li>10. explain how to apply ANN for classification</li><li>11. explain how to apply ANN for regression</li><li>12. Understand Back Propagation</li><li>13. Explain fuzzy thinking</li><li>14. Understand fuzzy rules</li><li>15. Explain fuzzy rules</li></ol>
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	<p>16. Understand linguistic variables and hedges  17. Understand fuzzy inference  18. Understand Mamdani-style Inference  19. Understand the PSO procedure  20. Understand the SVM procedure  21. Understand the role of kernels  22. Understand the advantages and disadvantages of different soft computing approaches</p>
<b>b- Intellectual Skills</b>	<p><b><u>By the end of the course, the student acquires high skills and an ability to understand:</u></b></p> <p><b>I10.</b> Define traditional and nontraditional problems, set goals towards solving them, and. observe results.  <b>I11.</b> Perform comparisons between (algorithms, methods, techniques...etc).  <b>I19.</b> Generate an innovative design to solve a problem containing a range of commercial and industrial constraints.</p> <ol style="list-style-type: none"> <li>1. Analyze efficiency and limitations of problem encoding</li> <li>2. Analyze the role of PSO tuning parameters</li> <li>3. Analyze complexity of soft computing approaches</li> </ol>
<b>c- Professional Skills</b>	<p><b><u>By the end of the course the student will have the ability to:</u></b></p> <p><b>P14.</b> Specify, design, and implement computer-based systems.  <b>P19.</b> Deploy effectively the tools used for the construction and documentation of software, with particular emphasis on understanding the whole process involved in using computers to solve practical problems.</p> <ol style="list-style-type: none"> <li>1. Apply Back propagation to adjust weights of ANN</li> <li>2. Use NN tool box</li> <li>3. Solve problems on fuzzy sets operations</li> <li>4. Apply Mamdani-style Inference</li> <li>5. Apply PSO for parameters tuning</li> </ol>
<b>d- General Skills</b>	<p><b>Students will be able to:</b></p> <p><b>G1.</b> Demonstrate the ability to make use of a range of learning resources and to manage one's own learning.  <b>G7.</b> Show the use of general computing facilities.  <b>G8.</b> Demonstrate an appreciation of the need to continue professional development in recognition of the requirement for life-long learning.</p> <ol style="list-style-type: none"> <li>1. Use Soft computing-related terminology</li> <li>2. Understand the principle of biological neural networks</li> <li>3. Understand how humans take fuzzy decisions</li> </ol>

<b>4- Course Content</b>	1	Understand the differences between hard and soft computing methods
	2	Apply several soft computing techniques for learning from experimental data.
	3	Measure the accuracy and performance of each technique through solving a common problem and compare the results.
<b>5- Teaching and Learning Methods</b>	Lectures, Labs, Projects, Individual study & self-learning.	
<b>6- Teaching and Learning Methods for Students with Special Needs</b>	<ul style="list-style-type: none"> <li>• Students with special needs are requested to contact the college representative for special needs ( currently Dr Hoda Mamdouh in room C504)</li> <li>• Consulting with lecturer during office hours.</li> <li>• Consulting with teaching assistant during office hours.</li> <li>• Private Sessions for redelivering the lecture contents.</li> <li>• For handicapped accessibility, please refer to program specification.</li> </ul>	
<b>7- Student Assessment:</b>		
<b>a- Procedures used:</b>	Exams and Individual Projects	
<b>b- Schedule:</b>	Week 7 exam 1 Projects through the semester Week 16 Final exam	
<b>c- Weighing of Assessment:</b>	7 <sup>th</sup> week exam 30% Project 20% Lab work 10% Final exam 40%	
<b>8- List of References:</b>		
<b>a- Course Notes</b>	From the Moodle on <a href="http://www.aast.edu">www.aast.edu</a>	
<b>b- Required Books (Textbooks)</b>	Kecman, Vajislav, <i>Learning And Soft Computing</i> , MIT PR.2001	
<b>c- Recommended Books</b>	<ol style="list-style-type: none"> <li>1. Kecman, V., <i>Learning and Soft Computing</i>, the MIT Press, Cambridge, MA, 2001.</li> <li>2. Jang, J.-S.R., Sun, C.-T., Mizutani, E., <i>Neuro-Fuzzy and Soft Computing</i>, Prentice Hall, 1997.</li> </ol>	

<b>d- Periodicals, Web Sites, ..., etc.</b>	

**Course Instructor:**

**Head of Department:**

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