



**University/Academy:** Arab Academy for Science, Technology & Maritime Transport  
**Faculty/Institute:** College of Engineering & Technology  
**Program:** B.Sc. Computer Engineering

**Form no. (12): Course Specification**

**1- Course Data**

Course Code: <b>CC524</b>	Course Title: <b>Neural Networks</b>	Academic Year/Level: <b>4<sup>th</sup> year / 7<sup>th</sup> semester</b>
Specialization: <b>Computer Engineering</b>	No. of Instructional Units <b>3</b>	Lecture <b>2</b>
		Practical <b>2</b>

**2- Course Aim**

• This course will provide students with detailed skills to use Artificial neural networks for solving many types of engineering problems such as mapping, clustering, and constrained optimization, in such areas as pattern recognition, signal processing, and control systems.

**3- Intended Learning Outcomes**

<b>a- Knowledge and Understanding</b>	<p><b>Through knowledge and understanding, students will be able to:</b></p> <p><b>a3. Methodologies of solving engineering problems, data collection and interpretation.</b></p> <p><b>a5. Engineering principles in the fields of logic design, circuit analysis, machine and assembly languages, computer organization and architectures, memory hierarchy, advanced computer architectures, embedded systems, signal processing, operating systems, real-time systems and reliability analysis.</b></p> <ul style="list-style-type: none"> <li>• Describe a specific type of Neural Networks in details (Competitive neural networks).</li> <li>• Describe a specific type of Neural Networks in details (KOHONEN self-organizing networks).</li> <li>• Describe a specific type of Neural Networks in details (Adaptive reasoning theory (ART)).</li> <li>• Describe a specific type of Neural Networks in details (Adaptive reasoning theory (ART)).</li> <li>• Describe a specific type of Neural Networks in details (Hopfield neural networks).</li> </ul> <p><b>a7. Technologies of data, image and graphics representation and organization on computer storage media.</b></p> <ul style="list-style-type: none"> <li>• Apply Neural Networks for a specific case study.</li> <li>• Describe course projects in details.</li> <li>• Discuss the progress of the course projects.</li> </ul>
<b>b- Intellectual Skills</b>	<p><b>Through intellectual skills, students will be able to:</b></p> <p><b>b1. Select/Apply appropriate mathematical and computer-based methods for modeling and analyzing problems and select appropriate solutions for engineering problems based on analytical thinking.</b></p> <p><b>b3. Combine, exchange, and assess different ideas, views, and knowledge from a range of sources.</b></p> <ul style="list-style-type: none"> <li>• Calculate weights by training single PERCEPTRON with certain data samples.</li> <li>• Train the neural network with sample data.</li> </ul> <p><b>b4. Assess and evaluate the characteristics and performance of components, systems and processes and investigate their failure.</b></p> <p><b>b5. Select, synthesize, and apply suitable IT tools to computer engineering problems</b></p> <ul style="list-style-type: none"> <li>• Test the neural network.</li> </ul>

	<ul style="list-style-type: none"> <li>• Train and test neural network with different transfer functions.</li> </ul>
<b>c- Professional Skills</b>	<p><b>Through professional and practical skills, students will be able to:</b>  <b>c2. Create and/or re-design a process, component or system, and carry out specialized engineering designs with neatness and aesthetics in design and approach.</b></p> <ul style="list-style-type: none"> <li>• Design a multilayer PERCEPTRON.</li> <li>• Design Competitive neural networks.</li> <li>• Design KOHONEN self-organizing networks.</li> <li>• Design Adaptive reasoning theory (ART).</li> </ul>
<b>d- General Skills</b>	<p><b>Through general and transferable skills, students will be able to:</b>  <b>d2. Work in stressful environment and within constraints, communicate effectively, lead and motivate individuals and effectively manage tasks, time, and resources.</b></p> <ul style="list-style-type: none"> <li>• Verify theory with practice using MATLAB.</li> </ul>

#### 4- Course Content

<b>Week No.1</b>	Introduction to basic concepts of neural networks.
<b>Week No.2</b>	Single PERCEPTRON.
<b>Week No.3</b>	The multilayer PERCEPTRON.
<b>Week No.4</b>	Artificial neural networks: applications, learning rules, and architecture.
<b>Week No.5</b>	Competitive neural networks.
<b>Week No.6</b>	KOHONEN self-organizing networks.
<b>Week No.7</b>	7th week Exam +Revision
<b>Week No.8</b>	Adaptive reasoning theory (ART)
<b>Week No.9</b>	Adaptive reasoning theory (ART)
<b>Week No.10</b>	Hopfield neural networks.
<b>Week No.11</b>	Neural networks implementation.
<b>Week No.12</b>	12th week Exam + Revision
<b>Week No.13</b>	Neural networks applications.
<b>Week No.14</b>	Neural networks applications.
<b>Week No.15</b>	Presentation of projects and Final Exam.
<b>Week No.16</b>	Presentation of projects and Final Exam.

#### 5- Teaching and Learning Methods

<ul style="list-style-type: none"> <li>• Lectures</li> <li>• Tutorials</li> <li>• Reports &amp; sheets</li> <li>• Laboratories</li> <li>• Seminars</li> </ul>
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#### 6-Teaching and Learning Methods for Students with Special Needs

<ul style="list-style-type: none"> <li>• Lectures</li> <li>• Tutorials</li> <li>• Reports &amp; sheets</li> <li>• Laboratories</li> <li>• Seminars</li> </ul> <p>The academic advisors of each student, as well as dedicated department TAs monitor the students' progress and solve any problem he/she may encounter.</p>
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#### 7- Student Assessment

<b>a-Procedures used</b>	1-Written Examinations to assess The Intended Learning Outcomes. 2-Class Activities (Reports, Discussions, -----) to assess The Intellectual Skills.	
<b>b- Schedule:</b>	Assessment 1 Assessment 2 Assessment 3 Assessment 4	7 <sup>th</sup> Week Written Exam 12 <sup>th</sup> Week Written Exam Continuous 16 <sup>th</sup> Week Final Written Exam
<b>c- Weighing of Assessment</b>	7 <sup>th</sup> Week Examination 12 <sup>th</sup> Week Examination Final-term Examination Oral Examination Practical Examination Semester Work Total	30 % 20 % 40 % 00 % 00 % 10 % 100%

#### 8- List of References:

<b>a- Course Notes</b>	
<b>b- Required Books</b> (Textbooks)	<ul style="list-style-type: none"> <li>• M. T. Hogan, H. Demuth, neural networks design, 1996.</li> <li>• Robert R. Trippi, Efraim Turban, Neural Networks In Finance and Investing, McGraw-Hill, 1996</li> </ul>
<b>c- Recommended Books</b>	<ul style="list-style-type: none"> <li>• Martin T.Hagan, Howard B. Demuth &amp; Mark Beale, Neural Networks:Design, Reprinted, 2002</li> </ul>
<b>d- Periodicals, Web Sites, etc.</b>	

**Course Instructor:**  
Assoc. Prof. Dr. Sherin Youssef

**Head of Department:**  
Prof. Dr. Mohamad AbouEI-Nasr

**Program Manager:**  
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