

## CCMS 795 PhD Written Qualifying Examination

PhD Qualifying Exam Topic	Department
<b>Artificial Intelligence</b>	<b>Computer Science</b>

The exam is closed book and closed notes. A separate formula sheet will be allowed (only formulas) - 1 sheet (size A4, front and back). Basic scientific calculator is allowed.

### Relevant Undergraduate Course(s) at Khalifa University:

- **COSC 330** Introduction to Artificial Intelligence
- **COSC 434** Introduction to Machine Learning

### Topics

Title/Description	Reading Material [Primary Textbook, Chapter]
Intelligent Agents and distinguished environments	[1, Ch. 2.1, 2.3, 2.4]
Uninformed Search techniques (incl. complexity analysis and optimality)	[1, Ch. 3.4.1-3.4.4]
Informed Search (Greedy search, A* search and admissibility)	[1, Ch. 3.5, 3.6]
Hill climbing, Simulated Annealing	[1, Ch. 4.1, 4.2]
Minimax Search	[1, Ch. 6.2]
Alpha-Beta Pruning	[1, Ch. 6.3]
Linear Classifiers	[1, Ch. 19.6]
Model selection, Precision/Recall, Area under the curve	[1, Ch. 19.4, 22.3.2], [2, Ch. 4.5]
Naïve Bayesian Classifier	[1, Ch. 20.2.2]
Linear regression, underfitting and overfitting	[2, Ch. 3.1], [1, Ch. 19.6]
Non-linear regression, neural networks and gradient descent	[1, Ch. 19.6.2, 21.], [2, Ch. 6.1, 6.2]
Deep Learning	[1, Ch. 22.1], [2, Ch. 6]
Convolutional Neural Networks	[1, Ch. 22.3], [2, Ch. 6.3]
Support vector machines	[2, Ch. 8.3]
Decision Trees, Random Forests	[1, Ch. 19.3, 19.8], [2, Ch. 7.2]
Unsupervised Learning	[2, Ch. 10.2]

### Primary textbooks:

- [1] Artificial Intelligence, A Modern Approach, Norvig and Russel, Pearson, 4th Edition, ISBN-13: 978-0134610993
- [2] Machine Learning: A First Course for Engineers and Scientists, by Andreas Lindholm, Lindholm et al, Cambridge University Press, 2022. ISBN: 978-1108843607

**Reference Material:**

- George F. Luger, Artificial Intelligence, Structures and Strategies for Complex Problem Solving, Addison–Wesley, 6th Edition, 2008. ISBN: 9780763773373.Bradie.