Master of Science in Artificial Intelligence ( <u>MSAI</u> )									
Course Name	Principles of Distri	buted Computing	مبادئ الحسابات الموزعة						
Course	Course Code	Course No.	Credit Hour	Prerequisite(s)					
Information	0911-1680	680	3 (3-0-6)	Programming Techniques in Al					
Course Track	Program Core		Electives						

**Course Description.** This course teaches very large scale distributed systems consisting millions of heterogeneous computing systems. Topics include brief introduction, design goals and types of distributed systems, distributed systems architectures, architectures styles and middleware organization, processes, threads, virtualization, cloud computing, client servers, code migration, communications, remote procedure calls and message oriented communication, naming, identifiers, addresses, flat naming, structured naming, and attribute-based naming, coordination, clock synchronization, logical clocks, mutual exclusion, election algorithms and Gossip-based coordination, consistency models, data-centric and client-centric consistency models, replication management, consistency protocols, case study for caching and replication on the Web, fault tolerance, reliable client server communication, reliable group communication, parallel and distributed deep learning using big data with case study and tools, Future of Computation for Machine Learning and Data Science. The course will refer to machine learning/deep learning applications wherever possible.

**Course Outcomes.** After the completion of this course, the student will be able to:

- 1. **Describe** challenges and characteristics of distributed systems **[C]**
- 2. Explain building distributed systems, algorithms, protocols and recent advancements [E]
- 3. Explain design issues and performance of distributed systems [C]
- 4. **Evaluate** effectiveness and shortcoming of the current solutions of distrusted systems **[E]**
- 5. Analyze how the principles are applied in modern distributed systems [A].

Assessment	Assignments	10%	Quiz	10%	Capstone	20%			
Policy (TC)	Midterm	20%	Final	40%	Project	20 70			
Textbook	Maarten van Steen, Andrew S. Tanenbaum, "Distributed Systems", 3 <sup>rd</sup> Edition, Published by Maarten van Steen, 2018. ISBN: 978-15-430573-8-6								
References	<ol> <li>George Coulouris, Jean Dollimore, Tim Kindberg, and Gordon Blair, "Distributed Systems: Concepts and Design", 5<sup>th</sup> Edition, 2011, Addison Wesley, ISBN 10: 0-13-214301-1,.</li> <li>Verbraeken, J., Wolting, M., Katzy, J., Kloppenburg, J., Verbelen, T., &amp; Rellermeyer, J.S. (2019). A Survey on Distributed Machine Learning. ArXiv, abs/1912.09789.</li> <li>ACM Symposium on Principles of Distributed Computing, <u>https://www.podc.org/</u> (Retrieved on 17 Feb 2020)</li> <li>Matthew Stewart, The Future of Computation for Machine Learning and Data Science,</li> </ol>								