Tentative Syllabus for Advanced Computer Systems (ACS)

Date	Person	Subject	Readings & Refs (All submissions via Absalon)
Nov 22, 2022	**PROGRAMMING ASSIGNMENT 1 RELEASED**		**Available by 9:00**
Nov 22, 2022	Dmitriy Traytel	- Course Overview - Fundamental Abstractions & Design Principles	Compendium [1]: Part 1
Nov 24, 2022	**THEORY ASSIGNMENT 1 RELEASED**		**Available by 9:00**
Nov 24, 2022	Dmitriy Traytel	- Modularity through Clients and Services, RPC - Techniques for Performance	Compendium: Parts 2 and 3 Video: Netflix's service architecture [13] (optional) Paper: Scalability! But at what COST? [14] (optional)
	TAs	- **Assignment Introduction + Java Best Practices**	A Certain Bookstore ☺
Nov 29, 2022	Dmitriy Traytel	- Concurrency Control: Two-Phase Locking (2PL) - Concurrency Control: Introduction to Schedules and Serializability	Compendium: Part 4 Franklin's chapter [3]: concurrency control (optional)
Dec 1, 2022	Dmitriy Traytel	- Concurrency Control: Serializability and Deadlocks - Concurrency Control: Advanced Topics	Compendium: Part 4 Video: 2PL [4] Franklin's chapter [3]: concurrency control (optional) STM papers [5,6] (optional)
	TAs	- Exercises + Q&A + Feedback	Refs above
Dec 1, 2022	**PROGRAMMING ASSIGNMENT 1 DEADLINE**		**Submission before 23:59**
Dec 2, 2022	**PROGRAMMING ASSIGNMENT 2 RELEASED**		**Available by 9:00**
Dec 6, 2022	Dmitriy Traytel	- Experimental Design - Recovery: Basic Concepts	Compendium: Parts 5 and 6 Jain's book [8] (optional)
Dec 8, 2022	Dmitriy Traytel	- Recovery: ARIES, normal operation, assumptions	Compendium: Part 5 Franklin's chapter [3]: recovery (optional) RAID paper [7] (optional)
	TAs	- Exercises + Q&A + Feedback	Refs above
Dec 8, 2022	**THEORY ASSIGNMENT 1 DEADLINE**		**Submission before 23:59**
Dec 9, 2022	**THEORY ASSIGNMENT 2 RELEASED**		**Available by 9:00**
Dec 13, 2022	Dmitriy Traytel	- Recovery: ARIES, recovery procedure	Compendium: Parts 4 and 5
Dec 15, 2022	Dmitriy Traytel	- Review and wrap-up of first half + Fun stuff + Q&A	Course materials and your judgment
	TAs	- Exercises + Q&A + Feedback	Refs above
Dec 15, 2022	**PROGRAMMING ASSIGNMENT 2 DEADLINE**		**Submission before 23:59**
Dec 16, 2022	**PROGRAMMING ASSIGNMENT 3 RELEASED**		**Available by 9:00**

Date	Person	Subject	Readings & Refs (All submissions via Absalon)
Dec 20, 2022	TAs	- Exercises + Q&A + Feedback	Refs above
Dec 22, 2022	**THEORY ASSIGNMENT 2 DEADLINE**		**Submission before 23:59**
Dec 23, 2022 **Jan 2, 2023**	**CHRISTMAS BREAK**		
Jan 3, 2023	Yongluan Zhou	- Reliability: Basic Concepts - Reliability: Replication	Compendium: Part 7 Dean's keynote [10] Video: James Hamilton's at Velocity 2010 [9] (optional)
Jan 5, 2022	**THEORY ASSIGNMENT 3 RELEASED**		**Available by 9:00**
Jan 5, 2023	Yongluan Zhou	- Reliability: More on Replication - Topics in Distributed Coordination	Compendium: Parts 7 and 8 Video: Facebook's scaling challenges [11] (optional)
	TAs	- Exercises + Q&A + Feedback	Refs above
Jan 5, 2022	**PROGRAMMING ASSIGNMENT 3 DEADLINE**		**Submission before 23:59**
Jan 5, 2023	**RESUBMISSION DEADLINE FOR PORGRAMMING AND THEORY ASSIGNMENTS 1 + 2** (ONLY AFTER A REASONABLE FIRST ATTEMPT FOR THE REGULAR DEADLINE)		**Submission before 23:59**
Jan 6, 2023	**THEORY AND PROGRAMMING EXERCISE 4 RELEASED**		**No hand-in required**
Jan 10, 2023	Yongluan Zhou	- Topics in Distributed Transactions - Communication: Message Queues	Compendium: Parts 8 and 9
Jan 12, 2023	Yongluan Zhou	- Data Processing: Basic Concepts and External Sorting	Compendium: Parts 10 and 11 Alphasort paper [12] (optional)
	TAs	- Exercises + Q&A + Feedback	Refs above
Jan 12, 2023	**THEORY ASSIGNMENT 3 DEADLINE**		**Submission before 23:59**
Jan 17, 2023	Yongluan Zhou	- Data Processing: Implementation of Relational Operators	Compendium: Part 11
Jan 19, 2023	Yongluan Zhou	- Data Processing: Parallelism - Course evaluation + wrap-up + Q&A	Compendium: Part 12 Course materials and your judgment
	TAs	- Final Q&A + Feedback	Course materials and your judgment
Jan 26, 2023	**You :-)**	**ACS WRITTEN EXAM**	

References

[1] Advanced Computer Systems (ACS): DIKU Course Compendium 2015/2016. Collected references from sources cited therein, organized by Marcos Vaz Salles and Michael Kirkedal Carøe.

[2] Amazon Web Services, AWS Educate. https://aws.amazon.com/education/awseducate/. DIKU is part of AWS Educate, which can be used to obtain credits for starter accounts. Students can use a cloud platform for experimentation (optional).

[3] M. Franklin. Concurrency Control and Recovery. The Handbook of Computer Science and Engineering, A. Tucker, ed., CRC Press, Boca Raton, 1997. Available at: http://citeseerx.ist.psu.edu/viewdoc/summary?doi=10.1.1.38.1437.

[4] Crazy Concurrency. Video at Youtube available at: http://www.youtube.com/watch?v=G3xH2SoMOF0, from CS186Berkeley.

[5] A. Dragojevic, P. Felber, V. Gramoli, R. Guerraoui: Why STM can be more than a research toy. Commun. ACM 54(4): 70-77 (2011). Available at: http://cacm.acm.org/magazines/2011/4/106585-why-stm-can-be-more-than-a-research-toy/fulltext.

[6] P. McKenney, M. Michael, J. Walpole. Why the grass may not be greener on the other side: a comparison of locking vs. transactional memory. PLOS 2007. Available at: http://web.cecs.pdx.edu/~walpole/papers/plos2007.pdf.

[7] D. Patterson, G. Gibson, R. Katz. A Case for Redundant Arrays of Inexpensive Disks (RAID). SIGMOD 1988. Available at: http://www.cs.cmu.edu/~garth/RAIDpaper/Patterson88.pdf.

[8] R. Jain. *The Art of Computer Systems Performance Analysis: Techniques for Experimental Design, Measurement, Simulation, and Modeling*. John Wiley & Sons, 1991.

[9] J. Hamilton. Datacenter Infrastructure Innovation. Keynote talk at Velocity 2010, available at: http://www.youtube.com/watch?v=kHW-ayt_Urk.

[10] J. Dean. Designs, Lessons and Advice from Building Large Distributed Systems. LADIS 2009. Slides available at: http://www.cs.cornell.edu/projects/ladis2009/talks/dean-keynote-ladis2009.pdf.

[11] J. Rothschild. High Performance at Massive Scale -- Lessons learned at Facebook. Available at: https://www.youtube.com/watch?v=lpFH9X_Fb8k.

[12] C. Nyberg, T. Barclay, Z. Cvetanovic, J. Gray, D. Lomet. AlphaSort: a Cache-Sensitive Parallel External Sort. VLDB Journal, 4, 603-627 (1995). Available at: http://link.springer.com/article/10.1007%2FBF01354877.

[13] A. Cockcroft. Dystopia as a Service. HotCloud 2013. Available at: https://www.usenix.org/conference/hotcloud13/workshop-program/presentations/cockcroft.

[14] F. McSherry, M. Isard, D.G. Murray. Scalability! But at what COST? HotOS 2015. Available at: https://www.usenix.org/system/files/conference/hotos15/hotos15-paper-mcsherry.pdf.