INF-2202 Concurrent and Data-Intensive Programming, autumn 2019

V2.0, Updated: 26.09.2019

1. Mandatory readings

- **AMP**: Maurice Herlihy & Nir Shavit. The Art of Multiprocessor Programming, ISBN 978-0123705914, chapters 2, 3, 7, 10 and 13
- **MC**: Charles Leiserson & Ilya Mirman: ***How to Survive the Multicore Revolution (or at Least Survive the Hype)*** (e-book)
- All papers and reading material referred to on the syllabus including the transparencies accompanying the textbook (we have links to these in the lecture plan below)
- All lectures, lecture notes, precept notes, and topic notes.
- All projects and exercises.

2. Supplementary readings (not "pensum")

- P. H. Ha, O. J. Anshus and I. Umar, "Efficient Concurrent Search Trees Using Portable Fine-Grained Locality," in IEEE Transactions on Parallel and Distributed Systems (TPDS), vol. 30, no. 7, pp. 1580-1595, 2019
- Yun, H., Yu, H.-F., Hsieh, C.-J., Vishwanathan, S. V. N. Dhillon, Inderjit. NOMAD: Non-locking, stOchastic Multi-machine algorithm for Asynchronous and Decentralized matrix completion, VLDB 2014
- Michael A. Bender, Martin Farach-Colton, Jeremy T. Fineman, Yonatan R. Fogel, Bradley C. Kuszmaul, and Jelani Nelson. 2007. Cache-oblivious streaming B-trees. In Proceedings of the 19th Annual ACM Symposium on Parallel algorithms and architectures (SPAA '07), 81-92.
- Guy Blelloch & Bruce Maggs. Parallel Algorithms (from Computer Science Handbook, Second Edition, ISBN-13: 978-1584883609)
- David E. Culler and Jaswinder Pal Singh. Parallel Computer Architecture – A Hardware/Software Approach. ISBN 1-55860-343-3
- The Fourth Paradigm: Data-Intensive Scientific Discovery. Edited by Tony Hey, Stewart Tansley, and Kristin Tolle. 2010.

3. Useful resources

- UPC++
- ACM parallel computing tech pack
- Intel Academic Resources especially Introduction to Parallel Programming for Shared Memory Parallelism (Intel)
- Pthreads tutorial
- Parallel programming patterns

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4. Course plan

- Lectures and colloquiums will normally be given in the Thursday and Tuesday/Wednesday slots respectively, unless otherwise specified. The lecturers will also notify students about changes to the schedule on the course homepage https://source.uit.no/INF-2202/home-f19/wikis/home
- Presenters: Phuong Ha (PH), Vi Tran (VT), Jo Inge Arnes (JIA), Phuong Ngoc Chau (PNC), Cheng-Hsiang Chiu (CHC) and other guest lecturers
- This plan is tentative. Changes will be made throughout the semester.

Week	Date	Topic	Note	Presenter
34	Aug. 22	1. Introduction	Reading: GreenBST paper, TPDS'19	PH
35	Aug. 29	2. Concurrent objects	Reading: AMP, Chapter 3, and G. Blelloch. Asynchronous algorithms	PH
36	Sept. 5	3. Introduction to UPC++ (Projects 1 & 2)	Reading: UPC++ Programmer's Guide *Projects handed out* this week.	JIA, PNC
	Sept. 6 *10:15-11:00, B203 Lille Auditorium*	4. Memory consistency models	Students are encouraged to attend the lecture.	VT
37	Sept. 12	*Arbeidslivsdagen ved UiT* (No lecture)		
38	Sept. 19 *Place: Aud. 5, MH-bygget*	5. Concurrent queues (Project 1)	Reading: AMP, Chapter 10	JIA
39	Sept. 26	No lecture due to the ship on fire in Breivika		
40	Oct. 3	6. Asynchronous decentralized matrix completion 7. (Project 2)	Reading: NOMAD paper, VLDB'14	PNC
41	Oct. 10	8. Design review on distributed concurrent queues	Each group presents and discusses their preliminary designs for the project solution.	Students with the queue project
42	Oct. 17	9. Design review on decentralized matrix completion	Each group should submit their design report (2-3 pages) by *Oct. 6*. Reviewers should submit their review report (1/2 page) by *Oct. 8*.	Students with the matrix project
	Oct. 18 (Friday) 12:15 – 13:00, TEKNOBYGGET 1.023AUD	10. Parallelism and Performance;	Reading: MC and T.H. Cormen et al. Multithreaded Algorithms, section 27.1.	VT

43	Oct. 24	11. Spin locks and contention	Reading: AMP, Chapter 7	VT
44	Oct. 31	12. Solution presentations on distributed concurrent queues	Each group presents their final solution for the assignment. Each group should submit their final solution reports (3-4 pages) by **Oct.27**	Students with the queue project
45	Nov. 7	13. Solution presentations on decentralized matrix completion	Reviewers should submit their review report (1/2 page) by **Oct. 29.**	Students with the matrix project
46	Nov. 14	TBA		
47	Nov. 21	14. Concurrent hashing	Reading: AMP, Chapter 13	CHC
48	Nov. 25 - 29	***Home exam:*** • ***Solution report and code handed in: Nov. 25*** • ***Review report handed in: Nov. 29***	Each student submits her/his final solution report (5-6 pages). Each student submits her/his review report (0.5 – 1 page) on the solution assigned.	