

PDC topics in CS2013 -- summary

KA	KU	tier 1 lo ct	tier 2 lo ct	opt lo ct	PDC learning objectives (condensed)
AR	Digital logic and digital systems	0	2	0	Comprehend that multicore is the trend in architecture. Describe implications of the "power wall."
AR	Assembly level machine organization	0	2	0	Describe instruction execution with threads & synchronization, SIMD. Describe ILP.
AR	Interfacing and communication	0	1	0	Compare common network organizations.
AR	Functional organization	0	0	1	Explain ILP using pipelining and hazards that occur.
AR	Multiprocessing and alternative architecture	0	0	5	Explain the concept of interconnection networks; characterize approaches and explain differences. Describe SIMD, MIMD, e.g.
AR	Performance enhancements	0	0	1	Discuss performance advantages of multithreading and difficulty achieving max benefits.
CN	Processing	0	0	3	Describe task, data, and event parallelism. Compare and contrast parallel programming paradigms. Design, code, test and debug parallel programs.
GV	Basic Rendering	0	0	1	Describe the basic graphics pipeline.
HC	Collaboration and communication	0	0	1	Describe the differences between synchronous and asynch. comm.
IAS	Defensive Programming	1	0	0	Demonstrate how to prevent a race condition from occurring.
IAS	Network Security	0	2	0	Describe categories of network threats and attacks. Describe virtues and limitations of security technologies.
IAS	Web Security	0	0	5	Understand the browser security model. Understand common types of vulnerabilities and attacks in web applications. ...
IAS	Security Policy and Governance	0	0	1	Understand the risks and benefits of outsourcing to the cloud
IM	Information Management Concepts	0	1	0	Describe approaches that scale up to globally networked systems.
IM	Distributed Databases	0	0	5	Explain the techniques used during distributed database design. ... Describe the three levels of software in the client-server model.
IM	Information Storage and Retrieval	0	0	1	Perform Internet-based research.
NC	Introduction	2	0	0	Articulate organization of the Internet. Define network terminology.
NC	Networked Applications	1	0	0	Implement a simple client-server socket-based application.
NC	Reliable Data Delivery	0	2	0	Describe reliable delivery protocols and implement one.
NC	Resource Allocation	0	2	0	Describe resources allocation in a network & congestion problem.
NC	Mobility	0	1	0	Describe how wireless networks support mobile users.
OS	Overview of Operating Systems	1	0	0	Discuss networked, client-server, distributed operating systems.
OS	Operating System Principles	0	1	0	Describe the need for concurrency in an operating system
OS	Concurrency	0	4	0	Demonstrate the potential run-time problems arising from the concurrent operation of many separate tasks. Summarize the range of mechanisms that can be employed to realize concurrent systems. Describe interrupts, dispatching, and context switching.
PBD	Web Platforms	0	0	2	Design and Implement a simple web application; describe software as a service.
PD	Parallelism Fundamentals	1	0	0	Distinguish data races from higher level races.
PD	Parallel Decomposition	1	3	0	Explain why synchronization is necessary in a specific parallel program; Write a correct and scalable parallel algorithm; Parallelize algorithms by applying task and data decomposition.
PD	Communication and Coordination	1	9	1	Give an example of an ordering of accesses among concurrent activities that is not sequentially consistent. Write correct concurrent task program. Use synchronized queue. Write a concurrent program that can reveal error, e.g. update shared variable. Describe how to avoid liveness. ...
PD	Parallel Algorithms, Analysis, and Programm	0	5	3	Critical path analysis; Define speedup; Provide producer-consumer example; identify issues in P-C algorithms; give examples where pipelining applies.
PD	Parallel Architecture	1	2	3	Explain the differences between shared and distributed memory; describe SMP; describe tasks that match SIMD arch.
PD	Parallel Performance	0	0	7	Amdahl's law, false sharing, scheduling, communication costs, load imbalance, ...
PD	Distributed Systems	0	0	9	Distinguish network faults from other kinds of failures; consensus algorithms; ...
PD	Cloud Computing	0	0	3	Discuss the importance of elasticity and resource management; deploy cloud infrastructure application; ...
PD	Formal Models and Semantics	0	0	6	Model a concurrent process using a formal model, such as pi-calculus. ...
PL	Concurrency and Parallelism	0	0	2	Write correct concurrent programs using multiple programming models. Explain why programming languages do not guarantee sequential consistency in the presence of data races.
SE	Software Design	0	1	1	Given a high-level design, identify the software architecture by differentiating among common software architectures such as 3-tier, pipe-and-filter, and client-server. Use components for concurrency.
SE	Software Construction	0	0	1	Rewrite a simple program to remove common vulnerabilities, such as race conditions.
SE	Software Verification Validation	0	1	0	Describe the issues and approaches to testing distributed and parallel systems.
SF	Computational Paradigms	3	0	0	Articulate the differences between single thread vs. multiple thread, single server vs. multiple server models. Write a simple seq. program and a paralel version. Evaluate performance of simple sequential and parallel versions of a program with different problem sizes, and be able to describe the speed-ups achieved.
SF	Parallelism	6	0	0	For a given program, distinguish between its sequential and parallel execution, and the performance implications thereof. Demonstrate a timeline when execution can take place in parallel. ... Write more than one parallel program. Use performance tools to measure speedup.
SF	Evaluation	2	0	0	Describe Amdahl's law and discuss its limitations. Design and conduct a performance-oriented experiment.

13 Count of KUs that include PDC learning  
 KA s objectives 12 16 17  
 8  
 KAs Tier 1 OR Tier 2 25

Count of PDC learning objectives 21 39 62