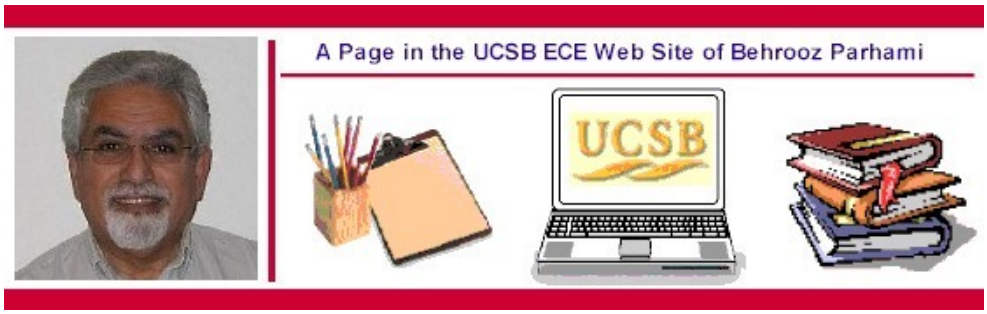

ECE 252C: Advanced Digital Design

Behrooz Parhami: 2007/06/20 || E-mail: parhami at ece.ucsb.edu || Other contact info at: Bottom of this page
Go up to: B. Parhami's course syllabi or his home page

Dr. Parhami took over the teaching of ECE 252C in the winter of 1996. Previously, the course had been taught primarily by the late Dr. James Howard. By covering sequential machines, computer arithmetic, and advanced microprocessor-based design, the graduate course sequence ECE 252A/B/C was meant to offer a firm foundation in the theories and techniques of advanced digital design. By the early 1990s, however, microprocessors had already become dominant and virtually every processor (even those used in highly parallel computers) was a microprocessor. Thus, in a sense, the microprocessor was the focus of every course in computer design and architecture. Dr. Parhami thus updated ECE 252C to deal with selected topics in COTS- (commercial off-the-shelf) and custom-based digital design.

Previous offerings of the course

- ECE 252C: Winter Quarter 1996

ECE 252C: Winter Quarter 1998 offering

Course:	ECE 252C – Advanced Topics in Digital System Design, University of California, Santa Barbara, Winter 1998, Enrollment Code 44628
Instructor:	Behrooz Parhami, Room 5155 Engineering I, Phone 805-893-3211, parhami@ece.ucsb.edu
Meetings:	TR 4:00-5:30 PM, Room 1440 Phelps Hall
Consultation:	Open office hours — T 3:00-4:00, W 1:00-2:00, R 10:00-11:00
Motivation:	Advances in algorithm design, development of techniques and tools for automatic mapping of algorithms to hardware, availability of aids to the analysis and synthesis of complex systems, and advances in manufacturing and packaging technologies have made the design of dedicated digital systems quite practical and cost-effective. Simultaneously, the demand for higher performance in control and signal processing applications has surpassed the dramatic improvements in circuit speed and density. This course familiarizes the students with state-of-the-art techniques in the design of high-performance digital systems for various applications. In so doing, it also acts as a bridge between advanced architecture courses dealing with abstract organizational notions (ECE 254A/B/C) and courses covering low-level digital design concepts and implementation techniques (ECE 152A/B, 252B). Relevant concepts will be explored both conceptually and via design case studies.
Prerequisites:	Logic design & switching theory and fundamentals of digital systems (ECE 152A/B or equivalents). ECE 154 and 252B would be helpful, but are not required.
References:	*Text* – Peatman, *Design with PIC Microcontrollers*, P-H, 1998 (new $48, used $36). *Reader* – A collection of technical papers, and chapters from various books, to serve as a resource for reading and design ideas (available from the Alternative, $36.38). *Main Journals* – *IEEE Trans. Computers* and *IEEE Trans. Circuits & Systems II*.
Evaluation:	Students will be evaluated based on these four components with the given weights: 20% -- Four 2-week miniprojects assigned on Thursdays 1/15, 1/29, 2/12, & 2/26. 25% -- Open-book midterm, Tu. 2/10, 4:00-6:00 [reader Sections A/B/E and text] 10% -- Research presentation in poster session, in lieu of final, Th. 3/19, 4:00-6:00 45% -- Term paper, or report on term project, due by 12:00 Noon, Fri. 3/20
Term paper:	A term paper, or report on term project, is required. Research ideas and requirements will be discussed on Th. 1/22. Topics must be finalized by Th. 2/5. Preliminary title, abstract, and reference list are due on Th. 2/19. Final paper/project title and reference list are due on Th. 3/5. Poster presentation of the work will be done on Th. 3/19. Complete paper is due before 12:00 Noon on Th. 3/20. All deadlines are firm.

Calendar:

Weekly course lectures have been scheduled as follows [reader sections in brackets]:

Tu/Th Jan 06/08	COTS-based design of combinational circuits [A1-A3]
Tu/Th Jan 13/15	Compact design via bit-serial and digit-serial arithmetic [B]
Tu/Th Jan 20/22	COTS-based design of sequential circuits [A4]
Tu/Th Jan 27/29	Digital design with microcontrollers (Textbook)
Tu/Th Feb 03/05	Design for flexibility and low power consumption [E]
Tu/Th Feb 10/12	MIDTERM EXAM + More on microcontrollers (Textbook)
Tu/Th Feb 17/19	Design for extremely high throughput or speed [D]
Tu/Th Feb 24/26	Compact high-throughput design via on-line arithmetic [C]
Tu/Th Mar 03/05	VLSI array processors for high computational power [F]
Tu/Th Mar 10/12	Trends in asynchronous and data-driven control design [G]

Return to: Top of this page

ECE 252C: Winter Quarter 1996 offering

Course:	ECE 252C – Advanced Topics in Digital System Design, University of California, Santa Barbara, Winter 1996, Enrollment Code 43265
Instructor:	Behrooz Parhami, Room 2159 Engineering I, Phone 805-893-3211, parhami@ece.ucsb.edu
Meetings:	TR 4:00-5:30 PM, Room 2108 Engineering I
Consultation:	Open office hours — T 3:00-4:00, W 1:00-2:00, R 11:00-12:00
Motivation:	Advances in algorithm design, development of techniques and tools for automatic mapping of algorithms to hardware, availability of aids to the analysis and synthesis of complex systems, and advances in manufacturing and packaging technologies have made the design of dedicated digital systems quite practical and cost-effective. Simultaneously, the demand for higher performance in control and signal processing applications has surpassed the dramatic improvements in circuit speed and density. This course familiarizes the students with state-of-the-art techniques in the design of high-performance digital systems for various applications. In so doing, it also acts as a bridge between courses covering low-level digital design concepts and implementation techniques (ECE 152A/B, 252B, e.g.) and advanced architecture courses dealing with more abstract organizational notions (ECE 254A/B/C). Relevant concepts will be explored both conceptually and via design case studies.
Prerequisites:	Logic design & switching theory and fundamentals of digital systems (ECE 152A/B or equivalents). ECE 154 and 252B would be helpful, but are not required.
References:	*Reader* – A course reader, consisting of technical papers and chapters from various texts is available from the Alternative copy shop in Isla Vista. *Recommended Book* -- M.J. Flynn, *Computer Architecture: Pipelined and Parallel Processor Design*, Jones and Bartlett, 1995. *Main Journals – IEEE Trans. Computers* and *IEEE Trans. Circuits & Systems II.* *Main Conferences* -- Symp. on VLSI Signal Processing, Application-Specific Array Processors, Microprogramming and Microarchitecture.
Evaluation:	Students will be evaluated based on these three components with the given weights: 20% -- Four 2-week miniprojects assigned on Thursdays 1/16, 1/30, 2/13, & 2/27. 30% -- Closed-book midterm, Th. 2/15, 4:00-6:00 PM [reader Sections A-E] 50% -- Open-book final exam, Sat. 3/23, 4:00-7:00 PM (covers everything)
Research:	An optional research paper or term project can be substituted for the final exam. Topics must be finalized by Tu. 2/6. Preliminary title, abstract, and reference list are due on Tu. 2/20. Final paper/project title and reference list are due on Tu. 3/12. Brief presentation of work to be done on Th. 3/14. Complete paper is due before 4:00 PM on Th. 3/21. All deadlines are firm.

Calendar:

Weekly course lectures have been scheduled as follows [reader sections in brackets]:

Tu 1/02	No lecture (holiday)	Th 1/04	Introduction [1-13]
Tu 1/09	Bit-serial arithmetic [15-42]	Th 1/11	Bit-serial arithmetic (cont.)
Tu 1/16	DCS1: Threshold voters [43-47]	Th 1/18	On-line arithmetic [49-77]
Tu 1/23	Pipelining [79-104, 115-122]	Th 1/25	Pipelining (cont.) (4:30-6:00)
Tu 1/30	DCS2: Fast counters [123-131]	Th 2/01	No lecture (instructor away)
Tu 2/06	Microprogramming [133-191]	Th 2/08	Microprogramming (cont.)

Tu 2/13	DCS3: Controllers [199-219]	Th 2/15	Midterm exam (4:00-6:00)
Tu 2/20	VLSI processor arrays [221-291]	Th 2/22	VLSI processor arrays (cont.)
Tu 2/27	DCS4: IIR filters [315-330]	Th 2/29	VLSI processor arrays (cont.)
Tu 3/05	Wavefront arrays [331-348]	Th 3/07	Fault-tolerant arrays [376-391]
Tu 3/12	Data-driven control [411-444]	Th 3/15	Project presentations

Return to: Top of this page || Go up to: B. Parhami's course syllabi or his home page

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