

Submit original with signatures + 1 copy + electronic copy to UAF Governance.

See <http://www.uaf.edu/uafgov/faculty/cd> for a complete description of the rules governing curriculum & course changes.

TRIAL COURSE OR NEW COURSE PROPOSAL

SUBMITTED BY:

Department	Electrical and Computer Eng.	College/School	CEM
Prepared by	Dejan Raskovic	Phone	474-5256
Email Contact	draskovic@alaska.edu	Faculty Contact	Dejan Raskovic

1. ACTION DESIRED (CHECK ONE):	Trial Course	<input type="checkbox"/>	New Course	<input checked="" type="checkbox"/>
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2. COURSE IDENTIFICATION:	Dept	EE	Course #	643	No. of Credits	3
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Justify upper/lower division status & number of credits:

Graduate course, no laboratory, meets two times a week for 1.5 hour

3. PROPOSED COURSE TITLE:	ADVANCED ARCHITECTURES FOR PARALLEL COMPUTING
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4. To be CROSS LISTED? YES/NO	NO	If yes, Dept:	<input type="text"/>	Course #	<input type="text"/>
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(Requires approval of both departments and deans involved. Add lines at end of form for such signatures.)

5. To be STACKED? YES/NO	NO	If yes, Dept.	<input type="text"/>	Course #	<input type="text"/>
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6. FREQUENCY OF OFFERING:	Fall, odd-numbered years
	Fall, Spring, Summer (Every, or Even-numbered Years, or Odd-numbered Years) – or As Demand Warrants

7. SEMESTER & YEAR OF FIRST OFFERING (if approved)	Fall 2011
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8. COURSE FORMAT:

NOTE: Course hours may not be compressed into fewer than three days per credit. Any course compressed into fewer than six weeks must be approved by the college or school's curriculum council. Furthermore, any core course compressed to less than six weeks must be approved by the core review committee.

COURSE FORMAT: (check all that apply)	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input checked="" type="checkbox"/> 6 weeks to full semester
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OTHER FORMAT
(specify)

Mode of delivery
(specify lecture, field trips, labs, etc)

Lectures and small group discussions

9. CONTACT HOURS PER WEEK:	3	LECTURE hours/weeks	0	LAB hours /week	<input type="text"/>	PRACTICUM hours /week
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Note: # of credits are based on contact hours. 800 minutes of lecture=1 credit. 2400 minutes of lab in a science course=1 credit. 1600 minutes in non-science lab=1 credit. 2400-4800 minutes of practicum=1 credit. 2400-8000 minutes of internship=1 credit. This must match with the syllabus. See <http://www.uaf.edu/uafgov/faculty/cd/credits.html> for more information on number of credits.

OTHER HOURS (specify type)	<input type="text"/>
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10. COMPLETE CATALOG DESCRIPTION including dept., number, title and credits (50 words or less, if possible):

EE 643 3 Credits
Selected Topics in Computer Engineering

The course covers massively parallel computer architectures and their application for computationally intensive engineering problems. Fundamental hardware concepts and issues in designing such systems are introduced. Compute Unified Device Architecture (CUDA), developed by NVIDIA for the compute engines in their graphic processing units (GPUs), will be used as an example and a practical platform for student assignments. Through assignments and a project students will learn how to employ extensive parallel processing capabilities of modern GPUs in C and Matlab programs for physical modeling, simulation, computational engineering, convolution, correlation, filtering, and similar problems of particular interest to engineering students. *Prerequisites: CS201 or ES201; EE443; graduate standing; or permission of the instructor.* (3+0)

11. **COURSE CLASSIFICATIONS:** (undergraduate courses only. Use approved criteria found on Page 10 & 17 of the manual. If justification is needed, attach on separate sheet.)

H = Humanities	<input type="checkbox"/>	S = Social Sciences	<input type="checkbox"/>
Will this course be used to fulfill a requirement for the baccalaureate core?		YES <input type="checkbox"/>	NO <input type="checkbox"/>
IF YES, check which core requirements it could be used to fulfill:			
O = Oral Intensive, Format 6	<input type="checkbox"/>	W = Writing Intensive, Format 7	<input type="checkbox"/>
		Natural Science, Format 8	<input type="checkbox"/>

12. **COURSE REPEATABILITY:**

Is this course repeatable for credit?	YES <input type="checkbox"/>	NO <input checked="" type="checkbox"/>
Justification: Indicate why the course can be repeated (for example, the course follows a different theme each time).		
How many times may the course be repeated for credit?	<input type="text"/>	TIMES
If the course can be repeated with variable credit, what is the maximum number of credit hours that may be earned for this course?	<input type="text"/>	CREDITS

13. **GRADING SYSTEM:** Specify only one.

LETTER:	<input checked="" type="checkbox"/>	PASS/FAIL:	<input type="checkbox"/>
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RESTRICTIONS ON ENROLLMENT (if any)

14. PREREQUISITES	CS201 or ES201; EE443; graduate standing; or permission of the instructor
These will be required before the student is allowed to enroll in the course.	
RECOMMENDED	EE463 or EE464

Classes, etc. that student is strongly encouraged to complete prior to this course.

15. SPECIAL RESTRICTIONS, CONDITIONS	
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16. PROPOSED COURSE FEES	\$ <input type="text"/>
Has a memo been submitted through your dean to the Provost & VCAS for <input type="text"/>	

17. **PREVIOUS HISTORY**

Has the course been offered as special topics or trial course previously?	Yes <input type="checkbox"/>
	Yes/No
If yes, give semester, year, course #, etc.:	Fall 2007: EE693, Fall 2009: EE693

18. **ESTIMATED IMPACT**

WHAT IMPACT, IF ANY, WILL THIS HAVE ON BUDGET, FACILITIES/SPACE, FACULTY, ETC.

The course has been offered twice already as a special topics course. Therefore, no additional impact is expected.

19. **LIBRARY COLLECTIONS**

Have you contacted the library collection development officer (kljensen@alaska.edu, 474-6695) with regard to the adequacy of library/media collections, equipment, and services available for the proposed course? If so, give date of contact and resolution. If not, explain why not.

No	<input checked="" type="checkbox"/>	Yes	<input type="checkbox"/>	Additional reading material will be accessible from the
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20. IMPACTS ON PROGRAMS/DEPTS

What programs/departments will be affected by this proposed action?
Include information on the Programs/Departments contacted (e.g., email, memo)

Electrical and Computer Engineering, Computer Science

21. POSITIVE AND NEGATIVE IMPACTS

Please specify **positive** and **negative** impacts on other courses, programs and departments resulting from the proposed action.

Positive impact is expected for electrical engineering graduate students that come from an electrical engineering program with computer engineering emphasis (such as the one offered by our Department). Also, the course will prepare all EE graduate students to take a more active role in computationally intensive research programs. No negative impact is expected, primarily because a similar course has been previously offered as a special topics course.

JUSTIFICATION FOR ACTION REQUESTED

The purpose of the department and campus-wide curriculum committees is to scrutinize course change and new course applications to make sure that the quality of UAF education is not lowered as a result of the proposed change. Please address this in your response. This section needs to be self-explanatory. Use as much space as needed to fully justify the proposed course.

The course has been offered two times as a special topics course. The purpose of the course is to introduce engineering students to advanced parallel computer architectures and to prepare them to use those architectures effectively for solving engineering and scientific problems. Also, graduate students in the Electrical and Computer Engineering department are facing the problem of having to take too many (more than allowed) Special Topics (693) courses. Approving Advanced Architectures for Parallel Computing as a new course will somewhat alleviate this problem.

APPROVALS:

	Date	
Signature, Chair, Program/Department of:		
	Date	
Signature, Chair, College/School Curriculum Council for:		
	Date	
Signature, Dean, College/School of:		
	Date	
Signature of Provost (if applicable)	Date	

Offerings above the level of approved programs must be approved in advance by the Provost.

ALL SIGNATURES MUST BE OBTAINED PRIOR TO SUBMISSION TO THE GOVERNANCE OFFICE

	Date	
Signature, Chair, UAF Faculty Senate Curriculum Review Committee		

ADDITIONAL SIGNATURES: (As needed for cross-listing and/or stacking)

	Date	
Signature, Chair, Program/Department of:		

	Date	
Signature, Chair, College/School Curriculum Council for:		

	Date	
Signature, Dean, College/School of:		

EE 643 – ADVANCED ARCHITECTURES FOR PARALLEL COMPUTING

COURSE INFORMATION

Instructor: Dr. Dejan Raskovic
Office: Duckering 225
Telephone: 474-5256
Email: draskovic@alaska.edu
Web: go.alaska.edu/draskovic

Lectures: Monday, Wednesday, 17:30 – 19:00, Duckering 210
Office Hours: Monday 15:00 – 17:00, Thursday 11:30 – 12:30

COURSE DESCRIPTION

The course covers massively parallel computer architectures and their application for computationally intensive engineering problems. Fundamental hardware concepts and issues in designing such systems are introduced. Compute Unified Device Architecture (CUDA), developed by NVIDIA for the compute engines in their graphic processing units (GPUs), will be used as an example and a practical platform for student assignments. Through assignments and a project students will learn how to employ extensive parallel processing capabilities of modern GPUs in C and Matlab programs for physical modeling, simulation, computational engineering, convolution, correlation, filtering, and similar problems of particular interest to engineering students. (3+0)

Prerequisites: CS201/ES201; EE443; or permission of the instructor.
Recommended: EE463 or EE464
Textbook: No official textbook will be used. Instead, a selection of research papers (available at the UAF library) will be assigned as a required reading. Also, complete documentation for CUDA architecture and other parallel architectures will be available through the manufacturer websites.
Supplementary Reading (recommended) H. El-Rewini, M. Abd-El-Bar, *Advanced Computer Architecture and Parallel Processing*. Wiley-Interscience 2005.
J.Hennessy, D. Patterson, *Computer Architecture - A Quantitative Approach*, 4th Edition. Elsevier 2007.

COURSE POLICIES

Grading:	
Assignments	30%
Final Exam	25%
Project	40%
Participation	5%

Letter grades will be assigned using a standard linear grading scheme 90+ A, 80+ B, etc.
(I may elect to set the grade cutoffs lower, but I will not set them higher.)

Plus/Minus grading will be used – see the UAF catalog for numerical GPA values

Attendance:

Students are strongly encouraged to attend every class and participate in the classroom discussion in a manner that would benefit other students as well.

Project:

A project topic for each student will be determined jointly by the student and the instructor, after discussing student's background and interests. A typical project assignment would be to design and implement a device for parallel computing (e.g., a multi-microcontroller system) or to solve an engineering or scientific problem using an existing parallel architecture.

Email:

Each student is required to establish a reliable email address and to send it to the instructor (draskovic@alaska.edu). This address will be used for class correspondence – announcements, laboratory assignments clarifications, etc. The course web page will contain useful information and will be updated throughout the course. The students will be notified by email when the content of the web site changes.

Exam:

Only a final exam will be given. The final exam will be comprehensive. No makeup exams will be given except for documented extenuating circumstances. If you can anticipate an absence (work commitments, intercollegiate sports), talk to your instructor as soon as possible to make arrangements. If the absence is unexpected (illness, family or personal difficulties), talk with your instructor at the earliest possible opportunity.

Assignments:

Regular homework will be assigned, and quizzes will be periodically given in class.

Homework

Homework problems will be typically due one week after assigned. No late homework will be accepted without an appropriate excuse. You are encouraged to work independently in study groups. The work you hand in should be your own effort, not merely a copy of another's work. If you have questions about a homework problem outside of office hours, feel free to contact the instructor by e-mail. Homework assignments are expected to be neat and legible. The grader is not obligated to decode scribbles; illegible answers will be assumed to be wrong.

Quizzes

A short quiz might be given at random times in class. Quizzes will typically cover the material from the previous week or two, and the last homework. The material for quizzes will include lectures, homework, reading assignments, and laboratory exercises, but may also cover reading assignments. No make up quizzes will be given.

The current version of this syllabus will be available on the course web page.

INSTRUCTIONAL METHODS

The course will employ a combination of traditional lectures, small group discussions (to discuss the assigned reading material), and programming sessions.

COURSE GOALS AND LEARNING OUTCOMES

The goal of the course is to familiarize students with hardware concepts behind modern massively parallel computing architectures. By the end of the course, the students should be able to fully understand the hardware organization of parallel systems and to apply them in their everyday engineering and scientific problems.

TENTATIVE COURSE TOPICS

WEEK	TOPIC
1	Review of main concepts
2	Sources of parallelism; Multiprocessors and thread-level parallelism
3	GPGPU : Introduction
4	GPU architectures and PC host architectures
5,6	GPU Architecture Streaming processing arrays Streaming multiprocessors Device memory Interconnect
7	CUDA programming and memory models
8	CUDA API, tools, optimizations, arithmetic
9, 10	Multiprocessor and multicore interconnection networks; Models of parallel computers;
11	Routing; Bandwidth; Communication costs
12	Performance analysis of multiprocessor architectures
12	Multiprocessor SOC
13	Designing for low power
14	Project presentations

STUDENT SUPPORT SERVICES

CEM computer technicians are located in the Duckering building room 153 (contact phone: 474-6146). They can help you set up a TSS account and use the equipment available in the lab (Duckering 210). If you need help in writing and presenting your project, you can contact the UAF Writing Center (801 Gruening building, phone: 474-5314) and the UAF Speaking Center (507 Gruening building, 474-5470).

DISABILITIES SERVICES

The Office of Disability Services implements the Americans with Disabilities Act (ADA), and insures that UAF students have equal access to the campus and course materials. The instructor, the teaching assistant, and the administrative assistant will work with the Office of Disabilities Services (203 WHIT, 474-7043) to provide reasonable accommodation to students with disabilities.

PLAGIARISM

As a UAF student, you are subject to UAF's Honor Code:

"Students will not collaborate on any quizzes, in-class exams, or take-home exams that will contribute to their grade in a course, unless permission is granted by the instructor of the course. Only those materials permitted by the instructor may be used to assist in quizzes and examinations.

Students will not represent the work of others as their own. A student will attribute the source of information not original with himself or herself (direct quotes or paraphrases) in compositions, theses and other reports. No work submitted for one course may be submitted for credit in another course without the explicit approval of both instructors. Violations of the Honor Code will result in a failing grade for the assignment and, ordinarily, for the course in which the violation occurred. Moreover, violation of the Honor Code may result in suspension or expulsion."