Course Change Request

Date Submitted: 02/23/18 2:51 pm

Viewing: **ECEN 469 : Advanced Computer Architecture**

Last approved: 08/15/17 3:16 am

Last edit: 03/05/18 9:28 am

Changes proposed by: w-lala

<table>
<thead>
<tr>
<th>Catalog Pages referencing this course</th>
<th>Department of Electrical &amp; Computer Engineering</th>
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<td></td>
<td>ECEN - Electrical &amp; Comp Engr (ECEN)</td>
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<tr>
<th>Other Courses referencing this course</th>
<th>As A Banner Equivalent:</th>
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<td>CSCE 469 : Advanced Computer Architecture</td>
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Faculty Senate Number

Contact(s)

<table>
<thead>
<tr>
<th>Name</th>
<th>E-mail</th>
<th>Phone</th>
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<tbody>
<tr>
<td>Windy Lala</td>
<td><a href="mailto:p-gratz@tamu.edu">p-gratz@tamu.edu</a></td>
<td>979-458-3127</td>
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<td>Paul Gratz</td>
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<td>979-488-4551</td>
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Rationale for Course

The proposed changes are part of a routine curriculum review.
The proposed changes are to meet the demand/interest of students.

Course prefix: ECEN  
Course number: 469

Department: Electrical & Computer Eng
College/School: College of Engineering
Academic Level: Undergraduate

Undergraduate course level justification (Select One)

Academic Level (alternate): Graduate


Complete Course Title
Advanced Computer Architecture

Abbreviated Course Title: ADV COMPUTER ARCHITECTURE

Catalog course description
Advanced computer architectures including memory designs, pipeline techniques, and parallel structures such as vector computers and multiprocessors.

Prerequisites and Restrictions
ECEN 350.

Concurrent Enrollment: No

Should catalog prerequisites / concurrent enrollment be enforced? No

In Workflow
1. ECEN Department Head
2. Curricular Services Review
3. EN Committee Preparer UG
4. EN Committee Chair UG
5. EN College Dean UG
6. UCC Preparer
7. UCC Chair
8. Faculty Senate Preparer
9. Faculty Senate
10. Provost II
11. President
12. Curricular Services
13. Banner

Approval Path
1. 02/23/18 2:51 pm
Windy Lala (w-lala): Approved for ECEN Department Head

2. 02/25/18 9:18 am
Sandra Williams (sandra-williams): Approved for Curricular Services Review

3. 02/28/18 1:41 pm
Eileen Hoy (ehoy): Rollback to ECEN Department Head for EN Committee Preparer UG

4. 02/28/18 1:59 pm
Windy Lala (w-lala): Approved for ECEN Department Head

5. 03/05/18 9:28 am
Sandra Williams (sandra-williams): Approved for Curricular Services Review

6. 03/05/18 11:43 am
Eileen Hoy (ehoy): Approved for EN Committee Preparer UG

7. 03/08/18 1:55 pm
Prasad Enjeti (enjeti): Approved for EN Committee Chair UG

8. 03/08/18 1:57 pm
Prasad Enjeti (enjeti): Approved for EN College Dean UG

https://nextcatalog.tamu.edu/courseleaf/approve/
Learning Outcomes

Meets traditional face-to-face learning outcomes.

Describe how learning outcomes are met or provide justification why they are not met.

Learning outcomes are met in the same manner as the traditional, on-campus sections; the study abroad sections are still face-to-face with a Texas A&M University instructor.

Hours

Meets traditional face-to-face hours.

Describe how hours are met or provide justification why they are not met.

Study Abroad sections are schedule to meet the same lecture requirements as a traditional, face-to-face section.

Will this course be taught as a distance education course?

No

Is 100% of this course going to be taught in Texas?

No

Will classroom space be needed for this course?

Yes No

This will be a required course or an elective course for the following programs:

Required (select program)
Elective (select program)

Program(s)

(85-CEEN) Computer Engineering - BS, Electrical Engineering Track

Has/will this course be(en) submitted for core curriculum consideration?

No

Has/will this course be(en) submitted for
Course Syllabus

Syllabus: Upload syllabus

Upload syllabus: ECEN469 syllabus.doc

Letters of support or other documentation: No

Additional information:

Reviewer Comments:

Sandra Williams (sandra-williams) (02/22/18 7:42 pm): Rollback: Please attach a traditional syllabus and a non-traditional syllabus (if applicable).

Eileen Hoy (ehoy) (02/28/18 1:41 pm): Rollback: Roll back for adding cross listing

Sandra Williams (sandra-williams) (03/09/18 3:32 pm): UCC approved March 9 via e-vote.

Reported to state? No
Course title and number  ECEN 469: Advanced Computer Architecture
Term  Summer, 2017, 3 credits

Course Description and Prerequisites
Computer architects have been striving to improve performance and efficiency since the first stored program computer was designed half a century ago. Superscalar execution is a key technique towards this aim. Superscalar processors issue more than one instruction per cycle. Most modern microprocessors from the latest smartphone ARM processors, to Intel Skylake i7s, to IBM's latest Power8 employ superscalar issue and other instruction-level parallelism techniques to enhance their performance. This course examines the tradeoffs and design considerations in the design of superscalar or instruction level parallel (ILP) microprocessors. The course will also explore other current microarchitectural approaches to improve performance and efficiency.

Prerequisites: ECEN 248

Learning Outcomes or Course Objectives
By the end of this course the student will have an understanding of the following fundamental Computer Architecture concepts:
A quantitative and qualitative understanding at a microarchitectural level of superscalar, superpipelined, dataflow, EDGE and VLIW processors; Available parallelism in programs; Out of order instruction execution; Reservation stations; Reorder buffers; Exception handling in out of order processors; Memory systems for superscalar processors; Cache organizations; Memory disambiguation and load/store reordering; Performance evaluation of superscalar processors; Multicore processors; Composable distributed processors.

Instructor Information
Name: Paul Gratz
Telephone number 979-488-4551
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Office hours TBD
Office location WEB 333M

Name: Stavros Kalafatis
Telephone number 979-458-4869
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Office hours TBD
Office location WEB 205E

Textbook and/or Resource Material
Modern Processor Design: Fundamentals of Superscalar Processors, John P. Shen and Mikko Lipasti, Waveland Press, Inc. (any edition is fine)

Grading Policies
Grade Breakdown:
50% – 2 Exams
40% – Homework Assignments, Simulation Assignments, Quizzes
10% – Class participation

Exams:
There will be two, in class exams. Each exam is worth 25% of the total grade.

Simulation and Homework assignments:
- You are expected to turn in the HW’s into eCampus by midnight of the day the HW is due.
- Any time after midnight is considered late.
- Late assignments will have a 10% penalty per day.
- HWs more than 7 days late will not be accepted

Quizzes:
- Each lecture will have an associated short quiz in eCampus.
- The quiz will be due immediately before the next lecture
- The quiz is automatically graded by eCampus, the student may retake the quiz as many times as needed

Class Participation:
- Come prepared to lecture, and be on-time.
- Your class participation grade will be based upon your ability to keep up with and add to the discussion during the discussion section.
- I will note which students respond to my questions and provide meaningful input and base this grade upon that.

Grading Scale

*Standard Letter Grading Scale:*
A = 90-100
B = 80-89
C = 70-79
D = 60-69
F = <60

Course Topics, Calendar of Activities, Major Assignment Dates

**Topic 1**
S&P Chp 1  
Course introduction; Moore’s Law; MHz wars; Power Wall; Definitions; Anatomy of a design; ISA/HSI

**Topic 2**
S&P Chp 1  
Processor performance; RISC v CISC; Components of execution; Amdahl’s Law; ILP; Superscalar

**Topic 3**
S&P Chp 2  
Pipelined processors review; Pipeline overheads; Hazards Review; Pipelining idealism; Generic Instruction Pipeline; Coalescing components; Physical Pipeline; Dependencies and Bypass Loops; Pipeline Interlock;

**Topic 4**
S&P Chp 3  
Memory System Review; Cache organization; Cache design parameters; Cache impact on performance; DRAM organization; Virtual Memory; Paging and the page table; TLBs; Multi-level page tables;

**Topic 5**
S&P Chp 4  
Limitations of Pipelining; Machine Parallelism; In-order Superscalar; OoO overview;
Americans with Disabilities Act (ADA)
The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact Disability Services, currently located in the Disability Services building at the Student Services at White Creek complex on west campus or call 979-845-1637. For additional information, visit http://disability.tamu.edu.

Academic Integrity
For additional information please visit: http://aggiehonor.tamu.edu

“An Aggie does not lie, cheat, or steal, or tolerate those who do.”