6. Change in Curriculum

Dwight Look College of Engineering

B.S. in Computer Engineering
   Electrical Engineering Track
   Computer Science Track

New Courses

Continuation of ENGR 112; programming and design with C++; topics include
design and implementation of functions, classes, and class hierarchies; software
development strategies; error handling and exceptions; testing and debugging;
type safety; strings; templates and the STL; graphics and GUIs; mathematical
computation; and principles of object-oriented programming. Prerequisites:
Knowledge of C++ programming, class design, portable graphics, and
parameterized types and their implementations.

architecture and design; use of register transfer languages and simulation tools
to describe and simulate computer operations; central processing unit
organization; microprogramming; input/output and memory system
architectures. Prerequisite: ECEN 248. Cross-listed with ECEN 350.

Change in Courses

CPSC 221. Data Structures and Algorithms.

Prerequisites
   From:   CPSC 121; corequisite MATH 302.
   To:     CPSC 113 or 121; corequisite MATH 202.

CPSC 313. Introduction to Computer Systems.

Prerequisites
   From:   CPSC 312.
   To:     CPSC 312 or corequisite CPSC 350.


Prerequisites
   From:   CPSC 312 and 314; corequisite CPSC 313.
   To:     CPSC 312 and 314; or CPSC 350; corequisite CPSC 313.

Lab, Credit Hours
From: (3-0). Credit 3.
To: (3-3). Credit 4.

Cross-list
From: None.
To: CPSC 350.

ECEN 449. Microprocessor Systems Design.

Lecture, Lab, Credit Hours
From: (3-3). Credit 4.
To: (2-2). Credit 3.


Lecture, Lab Hours
From: (3-0). Credit 3.
To: (2-2). Credit 3.

Prerequisites
From: ECEN 248 and 325.
To: ECEN 214 and 248.
MEMORANDUM

November 20, 2007

To: Robert Knight, Chair
   University Curriculum Committee

Through: Jo W. Howze, Associate Dean
         Dwight Look College of Engineering

From: Costas N. Georgiades
      Delbert A. Whitaker Chair Professor and Department Head

   Valerie E. Taylor
   Department Head and Royce E. Wisenbaker Professorship I in Engineering

Subject: Curriculum Changes for Computer Engineering

We request the attached changes in the Computer Engineering Degrees for the Departments of Electrical and Computer Engineering and Computer Science. The revised curriculum has been in progress for the past two years. The final layout has been discussed and approved by the Computer Engineering Curriculum Committee and the Computer Engineering faculty members in a meeting held on 30 April 2007.

Attached please find copies of the old and new curriculum sheets, new course request, and course change request.

Thank you for your time and consideration.
## Proposed CEEN/CECN Curriculum

### Freshman

| Course                             | Th-Pr | Cr | | Course                             | Th-Pr | Cr |
|------------------------------------|-------|----| |------------------------------------|-------|----|
| ENGL 104 - Comp. and Rhetoric      | (3-0) | 3  | | CHEM 107 - Chemistry for Engineers | (3-3) | 4  |
| ENGR 111 - Foundations of Engineering I | (1-3) | 2  | | ENGR 112 - Foundations of Engineering II | (1-3) | 2  |
| MATH 151 - Engineering Mathematics I | (3-2) | 4  | | MATH 152 - Engineering Mathematics II | (3-2) | 4  |
| PHYS 218 - Mechanics               | (3-3) | 4  | | PHYS 208 - Electricity and Optics   | (3-3) | 4  |
| American History                   | (3-0) | 3  | | American History                   | (3-0) | 3  |
| KINE 199*                          | (0-2) | 1  | | KINE 198**                         | (0-2) | 1  |

**Total Credits: 17**

### Sophomore

| Course                             | Th-Pr | Cr | | Course                             | Th-Pr | Cr |
|------------------------------------|-------|----| |------------------------------------|-------|----|
| CPSC 113 - Intermed Program & Design | (1-3) | 2  | | CPSC 221 - Data Struct. & Algo.    | (3-2) | 4  |
| ECEN 248 - Digital System Design   | (3-3) | 4  | | ECEN 214 - Electrical Circuit Theory | (3-3) | 4  |
| MATH 251 - Engineering Mathematics III | (3-0) | 3  | | STAT 211 - Principles of Statistics I | (3-0) | 3  |
| MATH 202 - Discrete Math           | (3-0) | 3  | | MATH 308 - Differential Equations  | (3-0) | 3  |
| ENGL 210 - Scientific and Tech. Writing or | (3-0) | 3  | | POLS 206 - American Government     | (3-0) | 3  |
| ENGL 301 - Technical Writing       | (3-0) | 3  | | | **Total Credits: 15**

### Junior

| Course                             | Th-Pr | Cr | | Course                             | Th-Pr | Cr |
|------------------------------------|-------|----| |------------------------------------|-------|----|
| CPSC 313 - Intro to Computer Systems | (0-2) | 1  | | ECEN 325 - Electronics             | (3-3) | 4  |
| CPSC 481 - Seminar                 | (3-1) | 3  | | CPSC 315 - Programming Studio      | (3-0) | 3  |
| ECEN 314 - Signals and Systems     | (3-3) | 4  | | CPSC 462/ECEN 449 - Microproc.     | (2-2) | 3  |
| ECEN 350/CPSC 350 - Comp. Arch     |       |    | | ECEN 464 - Digital Int. Cir. Design | (2-2) | 3  |
| POLS 207 - State & Local Govt.     |       |    | | MATH 311 - Topics in Applied Math I | (3-0) | 3  |

**Total Credits: 15**

### Senior

| Course                             | Th-Pr | Cr | | Course                             | Th-Pr | Cr |
|------------------------------------|-------|----| |------------------------------------|-------|----|
| Area Elective                      | 3     |    | | Area Elective                      | 3     |    |
| Area Elective                      | 3     |    | | Area Elective                      | 3     |    |
| Area Elective                      | 3     |    | | Area Elective                      | 3     |    |
| ENGR 482 - Ethics and Engineering  | (2-2) | 3  | | CPSC 483/ECEN 405                  | (1-6) | 3  |
| ENGR Elective                      |       |    | | Social Sci. Elective               |       |    |
| ENGR Elective                      |       |    | | Visual & Perf. Elective            |       |    |

**Total Credits: 15**
## CEEN Curriculum for Catalog #130

### Freshman

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# CECN Curriculum for Catalog #130

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<td>CPSC 211, 311, 410, 431</td>
<td>CPSC 221, CPSC 313, CPSC 315 (11 credits)</td>
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- Required to take 15 hours to fulfill the depth requirements
- Students take at least 2 depth sequences, with each sequence requiring at least 2 courses
- Remaining course from the sequence list or any approved 300/400 level course in CPSC or ECEN

***Track elective lists available in undergraduate advisor's office.***
Texas A&M University

Departmental Request for a New Course

Undergraduate • Graduate • Professional

Submit original form and 2 copies. Attach a course syllabus to each.

1. This request is submitted by the Department of Computer Science

2. Course prefix, number and complete title CPSC 113 - Intermediate Programming and Design

3. Course description (not more than 50 words) Continuation of ENGR 112; programming and design with C++; topics include design and implementation of functions, classes, and class hierarchies; software development strategies; error handling and exceptions; testing and debugging; type safety; strings; templates and the STL; graphics and GUIs;

4. Prerequisite(s) knowledge of C++ programming, class design, portable graphics, and parameterized types and their implementations

☐ Cross-listed with

5. Is this a variable credit course? ☐ Yes ☐ No If yes, from ______ to ______.

6. Is this a repeatable course? ☐ Yes ☐ No If yes, this course may be taken ______ times. Will the course be repeated within the same semester/term? ☐ Yes ☐ No

7. Has this course been taught as a 489/689? ☐ Yes ☐ No If yes, how many times? 2. Indicate the number of students enrolled for each academic period it was taught. Fall 2006 - 50, Spring 2007 - 197

8. This course will be:

a. required for students enrolled in the following degree program(s) (e.g., B.A. in history)

B. S. in Computer Engineering (CPSC track), B. S. in Computer Engineering (ECEN track)

b. an elective for students enrolled in the following degree program(s) (e.g., M.S., Ph.D. in geography)

9. If other departments are teaching or are responsible for related subject matter, the course must be coordinated with these departments. Attach approval letters.

10. Prefix Course # Title (exclude punctuation) CPSC 113 INTERMEDIATE PROGRAMMING

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Do not complete shaded area.

Approval recommended by:

Head of Department

11/29/07

Chair, College Review Committee

11/30/07

Head of Department (if cross-listed course)

Dean of College

11/30/07

Submitted to Coordinating Board by:

Director of Academic Support Services

Date

Effective Date

receiv

OAR/AS-504

have this form reviewed, please send to Linda F. Lacey, Mail Stop 1265 or fax to 847-8737.

NOV 30 2007

ACADEMIC SUPPORT SERVICES
COLLEGE OF ENGINEERING
DEPARTMENT OF COMPUTER SCIENCE
CONDENSED COURSE SYLLABUS
(Use 14 weeks as a standard semester)

Number and Name of Course: CPSC 113 Intermediate Programming and Design

Hours: Theory 1 Practice 3 Total 4 Credits 2

Prerequisites: Knowledge of C++ programming, class design, portable graphics, and parameterized types and their implementation

Curricula requiring this course: [ ] None, it will be elective.

1. Computer Engineering (CS track) 3
2. Computer Engineering (EE track) 4
5. 
6. 

Description of Course (Concise statement of purpose or design.) Continuation of ENGR 112; programming and design with C++. Topics include design and implementation of functions, classes, and class hierarchies; software development strategies; error handling and exceptions; testing and debugging; type safety; strings; templates and the STL; graphics and GUIs; mathematical computation; and principles of object-oriented programming.

Textbook(s): Programming: Principles and Practice Using C++, Bjarne Stroustrup and Lawrence Petersen (manuscript).

Course Outline by Major Topics and Approximate Time for Each:

<table>
<thead>
<tr>
<th>Topic</th>
<th>Th.</th>
<th>Pr.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C++ language features and programming environment</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Design and implementation of functions</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>OOP, classes, and class hierarchies</td>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>Software development strategies, testing, and debugging</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>Type safety, error handling, and exceptions</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Strings</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Templates and the STL</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>Graphics and GUIs</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>Mathematical computation</td>
<td>1</td>
<td>3</td>
</tr>
</tbody>
</table>

Grading: Homework 30%, Midterm exam 20%, Team Project 20%, Final Exam 25%
Quizzes 5%

Total Hours 14 42

Date: May 3, 2007

Course Supervisor: Dr. Walter Daugherty

ABET Classification: Science  [ ] Design  [ ] Math  [ ] Other  [ ]

Laboratory Requirements: Yes

Equipment Required: Yes
Americans with Disabilities Act (ADA)  
Policy Statement

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Texas A&M University
Departmental Request for a New Course
Undergraduate • Graduate • Professional
Submit original form and 2 copies. Attach a course syllabus to each.

1. This request is submitted by the Department of Computer Science

2. Course prefix, number and complete title CPSC 350, Computer Architecture and Design

3. Course description (not more than 50 words) Computer architecture and design; use of register transfer languages and simulation tools to describe and simulate computer operations; central processing unit organization; microprogramming; input/output and memory system architectures.

4. Prerequisite(s) ECEN 248 Cross-listed with ECEN 350

5. Is this a variable credit course? □ Yes ☑ No If yes, from _______ to _______.

6. Is this a repeatable course? □ Yes ☑ No If yes, this course may be taken ______ times. Will the course be repeated within the same semester/term? □ Yes ☑ No

7. Has this course been taught as a 489/689? □ Yes ☑ No If yes, how many times? ______ Indicate the number of students enrolled for each academic period it was taught. Taught previously as ELEN 350 and CPSC 321

8. This course will be:
   a. required for students enrolled in the following degree program(s) (e.g., B.A. in history)
      B.S. in ECEN and CEEN
   b. an elective for students enrolled in the following degree program(s) (e.g., M.S., Ph.D. in geography)

9. If other departments are teaching or are responsible for related subject matter, the course must be coordinated with these departments. Attach approval letters.

10. Prefix | Course # | Title (exclude punctuation) | Lect. | Lab | SCH | Subject Matter | Content Code | Admin. Unit | Acad. Year | FICE Code |
      CPSC 350 | COMPUTER ARCH & DESIGN | 03 | 03 | 04 | 11.02 | 01.00 | 06 | 0720 | 08-09 | 003632 |

 Approval recommended by: 

 Head of Department _______________________________ Date 11/24/07

 Head of Department (if cross-listed course) _______________________________ Date 11/26/07

 Chair, College Review Committee _______________________________ Date 11/26/07

 Dean of College _______________________________ Date 11/30/07

Submitted to Coordinating Board by:

 Director of Academic Support Services _______________________________ Date 

To have this form reviewed, please send to Linda F. Lacey, Mail Stop 1265 or fax to 847-8737.
OAR/AS-5/04

11 of 33 G
CPSC 350: Computer Architecture and Design

Description: Computer architecture and design; use of register transfer languages and simulation tools to describe and simulate computer operation; central processing unit organization, microprogramming, input/output and memory system architectures.

Prerequisite: ECEN 248

Course topics/calendar: Each lecture below is 1.5 hrs long. There are 30 lectures listed below, resulting in a total of 45 lecture hours. The number of lectures for each topic is indicated in parentheses.

Introduction (1)
- Computer organization
- Moore’s law
- Performance modeling
- Impact of advancing technology
- Operation of the computer hardware

Instruction Set Architectures (ISA) (4)
- Representing instructions on the computer
- Arithmetical and logical instructions
- Memory access instructions
- Control flow instructions
- Function calls instructions
- Input-output instructions
- SPIM- instruction set simulator

Computer Arithmetic (3)
- Signed and unsigned numbers
- Addition and subtraction
- Multiplication
- Division
- Floating point operations

Translating and starting a program (2)
- Compilers, compiler optimization
- Object code generation, assemblers
- Linking
- Run-time execution environment

Performance evaluation (2)
CPU performance and its factors
Performance metrics
Performance factors
Comparing performance
SPEC benchmarks

Hardware Description Languages (HDL) (2)
Verilog hardware description language
Design-Simulation Process
Structural Designs in Verilog
Behavioral HDL Description of Systems

Datapath and Control (5)
ALU design
Single-cycle implementation
Multi-cycle implementation
Microprogramming

Pipelining (5)
A Pipelined datapath
Pipelined control
Pipeline hazards: structural, control, data
Hazard detection and resolution
Exception handling

Memory Hierarchy (4)
Overview of SRAM and DRAM design
Basic of caches
Framework for memory hierarchy
Measuring memory performance

Peripherals (2)
Disk storage and dependability
I/O devices and their interface to the processor
Buses and other connections

**Grading:**

- Assignments, Labs and Quizzes 50%
- Midterm 25%
- Final Exam 25%

**Grading scale**
A standard grading scale will be utilized. The tentative grading scale for the course is:

<table>
<thead>
<tr>
<th>Percentage</th>
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</tr>
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<tbody>
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</tr>
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<td>Below 59%</td>
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**Labs:**

<table>
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<th>Lab</th>
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<tr>
<td>1</td>
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<td>SPIM: Function Calls</td>
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<td>5</td>
<td>SPIM: I/O operations</td>
</tr>
<tr>
<td>6</td>
<td>SPIM: Assembler and Linker</td>
</tr>
<tr>
<td>7</td>
<td>Introduction to Verilog</td>
</tr>
<tr>
<td>8</td>
<td>Design of Single-Cycle Processor, part 1</td>
</tr>
<tr>
<td>9</td>
<td>Design of Single-Cycle Processor, part 1 (cont.)</td>
</tr>
<tr>
<td>10</td>
<td>Design of Single-Cycle Processor, part 2</td>
</tr>
<tr>
<td>11</td>
<td>Design of Single-Cycle Processor, part 2 (cont.)</td>
</tr>
<tr>
<td>12</td>
<td>Design of Multi-cycle Processor</td>
</tr>
<tr>
<td>13</td>
<td>Design of Multi-cycle Processor (cont.)</td>
</tr>
<tr>
<td>14</td>
<td>Pipelined implementation</td>
</tr>
</tbody>
</table>

**List of assignments:**

(1) Translation of High-Level constructs into MIPS  
(2) Compiler Optimization  
(3) CPU performance and its factors  
(4) Building a datapath  
(5) Pipelining and hazards

**Tests:** Midterm, Final + 4 Quizzes
Textbook:

Required:

Computer Organization and Design: The Hardware/Software Interface by Patterson and Hennessy. Morgan Kaufmann publishers, 3rd edition

Reference:


Americans with Disabilities Act (ADA) Policy Statement

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Academic Integrity Statement

All syllabi shall contain a section that states the Aggie Honor Code and refers the student to the Honor Council Rules and Procedures on the web.

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Texas A&M University
Departmental Request for a Change in Course
Undergraduate • Graduate • Professional
Submit original form and 2 copies

1. This request is submitted by the Department of Computer Science

2. Course prefix, number and complete title of course: CPSC 221, Data Structures and Algorithms

3. Change requested:
   a) Prerequisite(s): From CPSC 121; corequisite MATH 302 To CPSC 121 or CPSC 113; corequisite MATH 202
   b) Withdrawal (reason)
   c) Cross-list with
   d) Change in course title and description. Enter complete current course title and current course description; complete proposed course title and proposed course description in items 4 and 5.
   e) Change in credit/contact hours. Complete item 6b. Underscore change(s). Attach a course syllabus.

4. Complete current course title and current course description:

5. Complete proposed course title and proposed course description (not to exceed 50 words):

6. a) As currently in course inventory:

   Prefix  Course #  Title (exclude punctuation)
   Lect.  Lab  SCH  Subject Matter Content Code  Admin. Unit  FICE Code
   Level

   b) Changed to:

   Prefix  Course #  Title (exclude punctuation)
   Lect.  Lab  SCH  Subject Matter Content Code  Admin. Unit  Acad. Year  FICE Code
   Level

   Approval recommended by:

   [Signatures and dates]

   Head of Department  Date  Chair, College Review Committee  Date

   Head of Department (if cross-listed course)  Date  Dean of College  Date

   Submitted to Coordinating Board by:

   [Signatures and dates]

   Director of Academic Support Services  Date  Effective Date

To have this form reviewed, please send to Linda F. Lacey, Mail Stop 1265 or fax to 847-8737.
OAR/AS- 5/04
COLLEGE OF ENGINEERING
DEPARTMENT OF COMPUTER SCIENCE
CONDENSED COURSE SYLLABUS
(Use 14 weeks as a standard semester)

Number and Name of Course: CPSC 221 Data Structures and Algorithms

Hours: Theory 3 Practice 2 Total 5 Credits 4

Prerequisites: CPSC 121, Introduction to Program Design and Concepts

Corequisite: CPSC 222, Discrete Structures for Computing

Curricula requiring this course: [ ] None, it will be elective.

1. BS in Computer Science 3. __________________________ 5.
2. __________________________ 4. __________________________ 6.

Description of Course (Concise statement of purpose or design.)
Specification and implementation of basic abstract data types and their associated algorithms: stacks, queues, lists, sorting and selection, searching, graphs, and hashing; performance tradeoffs of different implementations and asymptotic analysis of running time and memory usage; includes the execution of student written programs in C++.


Course Outline by Major Topics and Approximate Time for Each:

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<thead>
<tr>
<th>Linear data structures:</th>
<th>HOURS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stacks, queues and lists</td>
<td>Th. 6  Pr. 4</td>
</tr>
<tr>
<td>Sorting and selection</td>
<td>Th. 9  Pr. 6</td>
</tr>
<tr>
<td>Searching:</td>
<td>Th. 9  Pr. 6</td>
</tr>
<tr>
<td>Trees, heaps, priority queues</td>
<td></td>
</tr>
<tr>
<td>Graphs:</td>
<td>Th. 9  Pr. 6</td>
</tr>
<tr>
<td>Depth-first search, breadth-first search, shortest path algorithms, topological sort</td>
<td></td>
</tr>
<tr>
<td>Hashing</td>
<td>Th. 9  Pr. 6</td>
</tr>
</tbody>
</table>

Grading: Midterms = 25 %, Final Exam = 25 %, Assignments = 25 %, Labs = 25 %, Total = 100%

Total Hours 42 28

Date: Oct. 5, 2006  Course Supervisor: Nancy Amato

ABET Classification: Science 2  Design 2  Math 2  Other 0

Laboratory Requirements: Yes
Equipment Required: computers

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**Copyrights**

The handouts used in this course are copyrighted. By "Handouts" we mean all materials generated for this class, which include but are not limited to syllabi, lab problems, in-class materials, review sheets, and additional problem sets. Because these materials are copyrighted, you do not have the right to copy such handouts, unless the author expressly grants permission.

**Scholastic Dishonesty**

As commonly defined, plagiarism consists of passing off as one's own the ideas, work, writings, etc., that belong to another. In accordance with this definition, you are committing plagiarism if you copy the work of another person and turn it in as your own, even if you have the permission of the person. Plagiarism is one of the worst academic sins, for the plagiarist destroys the trust among colleagues without which research cannot be safely communicated. If you have questions regarding plagiarism, please consult the latest issue of the Texas A&M University Student Rules [http://student-rules.tamu.edu], under the section "Scholastic Dishonesty".

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Texas A&M University
Departmental Request for a Change in Course
Undergraduate • Graduate • Professional

1. This request is submitted by the Department of Computer Science.

2. Course prefix, number and complete title of course: CPSC 313, Introduction to Computer Systems.

3. Change requested:
   a) Prerequisite(s): From CPSC 312 To CPSC 312 or corequisite CPSC 350.
   b) Withdrawal (reason)
   c) Cross-list with 
      Cross-listed courses require the signatures of both department heads.
      d) Change in course title and description. Enter complete current course title and current course description; complete proposed course title and proposed course description in items 4 and 5.
      e) Change in credit/contact hours. Complete item 6b. Underscore change(s). Attach a course syllabus.

4. Complete current course title and current course description:

5. Complete proposed course title and proposed course description (not to exceed 50 words):

6. a) As currently in course inventory:

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Lect.</td>
<td>Lab SCH</td>
<td>Subject Matter</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
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b) Changed to:

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<td></td>
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</tr>
</tbody>
</table>

Approval recommended by:

Donald J Smith 5/4/07

Head of Department Date

Chair, College Review Committee 11/30/07

Head of Department (if cross-listed course) Date

Dean of College 11/30/07

Submitted to Coordinating Board by:

Dean of College Date

Director of Academic Support Services Date

Effective Date

To have this form reviewed, please send to Linda F. Lacey, Mail Stop 1265 or fax to 847-8737.

OAR/AS-504

19 of 33 G
Texas A&M University
Departmental Request for a Change in Course
Undergraduate • Graduate • Professional
• Submit original form and 2 copies •

1. This request is submitted by the Department of Computer Science

2. Course prefix, number and complete title of course: CPSC 315, Programming Studio

3. Change requested:
   a) Prerequisite(s): From CPSC 312 and CPSC 314; corequisite CPSC 313 to CPSC 312 and CPSC 314; or CPSC 350. Corequisite CPSC 319
   b) Withdrawal (reason)
   c) Cross-list with Cross-listed courses require the signatures of both department heads.
   d) Change in course title and description. Enter complete current course title and current course description; complete proposed course title and proposed course description in items 4 and 5.
   e) Change in credit/contact hours. Complete item 6b. Underscore change(s). Attach a course syllabus.

4. Complete current course title and current course description:

5. Complete proposed course title and proposed course description (not to exceed 50 words):

6. a) As currently in course inventory:

   Prefix | Course # | Title (exclude punctuation) |
   --- | --- | --- |
   | | |

   Lect. | Lab | SCH | Subject Matter Content Code | Admin. Unit | FICE Code |
   --- | --- | --- | --- | --- | --- |
   | | | | | | |

   Do not complete shaded area.

   Level

   b) Changed to:

   Prefix | Course # | Title (exclude punctuation) |
   --- | --- | --- |
   | | |

   Lect. | Lab | SCH | Subject Matter Content Code | Admin. Unit | Acad. Year | FICE Code |
   --- | --- | --- | --- | --- | --- | --- |
   | | | | | | |

   Level

Approval recommended by:  

Head of Department  

Date  

Chair, College Review Committee  

Date  

Head of Department (if cross-listed course)  

Date  

Dean of College  

Date  

Submitted to Coordinating Board by:  

Date  

Dean of College  

Date  

Director of Academic Support Services  

Date  

Effective Date

To have this form reviewed, please send to Linda F. Lacey, Mail Stop 1265 or fax to 847-8737.

OAR/AS- 504

20 of 33 G
Texas A&M University
Departmental Request for a Change in Course
Undergraduate • Graduate • Professional

1. This request is submitted by the Department of ____________________________
   Electrical and Computer Engineering

2. Course prefix, number and complete title of course: ECEN 350-Computer Architecture and Design

3. Change requested:
   a) Prerequisite(s): From ____________________________ To ____________________________
   b) Withdrawal (reason) __________________________________________________________
   c) Cross-list with CPSC 350
      Cross-listed courses require the signatures of both department heads.
   d) Change in course title and description. Enter complete current course title and current course description; complete proposed course title and proposed course description in items 4 and 5.
   e) Change in credit/contact hours. Complete item 6b. Underscore change(s). Attach a course syllabus.

4. Complete current course title and current course description:
   __________________________________________________________
   __________________________________________________________
   __________________________________________________________

5. Complete proposed course title and proposed course description (not to exceed 50 words):
   __________________________________________________________
   __________________________________________________________
   __________________________________________________________

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<tbody>
<tr>
<td>ECEN 350</td>
<td>COMPUTER ARCH &amp; DESIGN</td>
<td></td>
</tr>
</tbody>
</table>

   Lect. Lab SCH Subject Matter Content Code Admin. Unit FICE Code
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   Do not complete shaded area.

   b) Changed to:

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   0 3 0 3 0 4 1 4 0 9 0 1 0 0 0 6 0 9 3 6 0 8 0 9 0 0 3 6 3 2
   Level 3

   Approval recommended by:

   Head of Department ____________________________ Date ____________________________
   Chair, College Review Committee ____________________________ Date ____________________________
   Dean of College ____________________________ Date ____________________________
   Director of Academic Support Services ____________________________ Date ____________________________

To have this form reviewed, please send to Linda F. Lacey, Mail Stop 1265 or fax to 847-8737.

OAR/AS: 504

21 of 33 G
ECEN 350: Computer Architecture and Design

Description: Computer architecture and design; use of register transfer languages and simulation tools to describe and simulate computer operation; central processing unit organization, microprogramming, input/output and memory system architectures.

Instructor information: Dr. Mi Lu/Alex Sprintson

Prerequisite: ELEN 248

Course topics/calendar:

Introduction
  Computer organization
  Moore’s law
  Performance modeling
  Impact of advancing technology
  Operation of the computer hardware

Instruction Set Architectures (ISA)
  Representing instructions on the computer
  Arithmetical and logical instructions
  Memory access instructions
  Control flow instructions
  Function calls instructions
  Input-output instructions
  SPIM- instruction set simulator

Computer Arithmetic
  Signed and unsigned numbers
  Addition and subtraction
  Multiplication
  Division
  Floating point operations

Translating and starting a program
  Compilers, compiler optimization
  Object code generation, assemblers
  Linking
  Run-time execution environment

Performance evaluation
  CPU performance and its factors
Performance metrics
Performance factors
Comparing performance
SPEC benchmarks

Hardware Description Languages (HDL)
Verilog hardware description language
Design-Simulation Process
Structural Designs in Verilog
Behavioral HDL Description of Systems

Datapath and Control
ALU design
Single-cycle implementation
Multi-cycle implementation
Microprogramming

Pipelining
A Pipelined datapath
Pipelined control
Pipeline hazards: structural, control, data
Hazard detection and resolution
Exception handling

Memory Hierarchy
Overview of SRAM and DRAM design
Basic of caches
Framework for memory hierarchy
Measuring memory performance

Peripherals
Disk storage and dependability
I/O devices and their interface to the processor
Buses and other connections

Grading:

- Assignments, Labs and Quizzes 50%
- Midterm 25%
- Final Exam 25%
Grading scale

A standard grading scale will be utilized. The tentative grading scale for the course is:

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Labs:

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<td>SPIM: Assembler and Linker</td>
</tr>
<tr>
<td>7</td>
<td>Introduction to Verilog</td>
</tr>
<tr>
<td>8</td>
<td>Design of Single-Cycle Processor, part 1</td>
</tr>
<tr>
<td>9</td>
<td>Design of Single-Cycle Processor, part 1 (cont.)</td>
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<tr>
<td>10</td>
<td>Design of Single-Cycle Processor, part 2</td>
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<td>11</td>
<td>Design of Single-Cycle Processor, part 2 (cont.)</td>
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<tr>
<td>12</td>
<td>Design of Multi-cycle Processor</td>
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<tr>
<td>13</td>
<td>Design of Multi-cycle Processor (cont.)</td>
</tr>
<tr>
<td>14</td>
<td>Pipelined implementation</td>
</tr>
</tbody>
</table>

List of assignments:

1. Translation of High-Level c Constructs into MIPS
2. Compiler Optimization
3. CPU performance and its factors
4. Building a datapath
5. Pipelining and hazards
Tests: Midterm, Final + 4 Quizzes

Textbook:

Required:

Computer Organization and Design: The Hardware/Software Interface by Patterson and Hennessy. Morgan Kaufmann publishers, 3rd edition

Reference:


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Texas A&M University
Departmental Request for a Change in Course
Undergraduate * Graduate * Professional
* Submit original form and attachments *
This request is submitted by the Department of Electrical and Computer Engineering
2. Course prefix, number and complete title of course:
ECEN 449-Microprocessory System Design

Attach a brief supporting statement for changes made to items 3a thru 3d, and 5 below.
3. Change requested
   a) Prerequisite(s): From ___________________________ To ___________________________
   b) Withdrawal (reason) ____________________________
   c) Cross-list with ____________________________
      Cross-listed courses require the signature of both department heads.
   d) Change in course title and description. Enter complete current course title and current course description;
      complete proposed course title and proposed course description in items 4 and 5.
   e) Change in credit/contact hours. Complete item 6b. Underscore change(s). Attach a course syllabus.

4. Complete current course title and current course description:


5. Complete proposed course title and proposed course description (not to exceed 50 words):


6. a) As currently in course inventory:

<table>
<thead>
<tr>
<th>Prefix</th>
<th>Course #</th>
<th>Title (excluding punctuation)</th>
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<tr>
<td>ECEN</td>
<td>449</td>
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<tr>
<td>Lect.</td>
<td>Lab</td>
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<tr>
<td>0303</td>
<td>041409010006</td>
<td>093608-09</td>
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b) Change to:

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<tr>
<td>0202</td>
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<td>093608-09</td>
</tr>
</tbody>
</table>

Approval recommended by:

Head of Department 11/26/07
Chair, College Review Committee 11/30/07

Head of Department (if cross-listed course) Date
Dean of College Date

Submitted to Coordinating Board by:

Director of Academic Support Services Date
Dean of College 11/30/07

Questions regarding this form should be directed to Sandra Williams at 845-8836.
OAR/AS – 04/07
Electrical and Computer Engineering –
ECEN 449 Microprocessor System Design Syllabus

Course Description: An introduction to microprocessors; 16/32 bit single board computer hardware and software; chip select equations for memory board design, serial and parallel I/O interfacing, ROM, static and dynamic RAM circuits for no wait-state design, assembly language programming, real mode programming, stack models, subroutines, and I/O processing.

Prerequisites: ECEN 350 (Computer Architecture) or approval of instructor

Course Credit: (2-2) 3 credit hours

Instructor: Prof. Xi Zhang
Office: 333N WERC
Office Hours: TR 9:30AM-10:45AM
E-mail: elen449@eceserver.tamu.edu
Class Website: http://ece.tamu.edu/~elen449


References: Intel Data Books by the Intel Corporation

“ISA System Architecture” By Shanley and Anderson
“The Art of Assembly” by Randal Hyde

Grading Policy (Tentative):

Labs: 20%
Homework: 15%
Quizzes: 5%
EXAM 1: 20%
EXAM 2: 20%
EXAM 3: 20%

Laboratory: Design and construct a prototype Industry Standard Architecture (ISA) interface card containing DIP switches, LEDs, and LCD display, and a A/D converter. Write assembly language routines and develop troubleshooting skills using a logic analyzer and oscilloscope.
# Course Schedule (Tentative)

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
<th>Chapters</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Class Introduction, microprocessor background, microprocessor architecture, data representation</td>
<td>1, 2</td>
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<tr>
<td>2</td>
<td>Programming models, addressing models</td>
<td>2, 3</td>
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<tr>
<td>3</td>
<td>Stack programming modes, data movement instructions</td>
<td>3, 4</td>
</tr>
<tr>
<td>4</td>
<td>Data moving instructions, string, Data transfers, assembler directives</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>Hardware specifications, bus timing, minimum/maximum mode</td>
<td>9</td>
</tr>
<tr>
<td>6</td>
<td>Arithmetic and logic instructions</td>
<td>5</td>
</tr>
<tr>
<td>7</td>
<td>Program control instructions</td>
<td>6</td>
</tr>
<tr>
<td>8</td>
<td>Procedures, modular programming, disk files</td>
<td>8</td>
</tr>
<tr>
<td>9</td>
<td>Interrupt hook, memory interfaces</td>
<td>8, 10</td>
</tr>
<tr>
<td>10</td>
<td>Dynamic RAM, static RAM</td>
<td>10</td>
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<tr>
<td>11</td>
<td>EDO, SDRAM, Memory System</td>
<td>10</td>
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<tr>
<td>12</td>
<td>I/O interfaces</td>
<td>11</td>
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<tr>
<td>13</td>
<td>Programmable peripheral Interface, PIT, UART</td>
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<td>14</td>
<td>TBD</td>
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<tr>
<td>15</td>
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Texas A&M University

Departmental Request for a Change in Course
Undergraduate ♦ Graduate ♦ Professional

1. This request is submitted by the Department of ___________

2. Course prefix, number and complete title of course: ___________

3. Change requested
   a) Prerequisite(s): From ___________ To ___________
   b) Withdrawal (reason) ___________
   c) Cross-list with ___________
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<td>DIG INTEGRATED CIRC DES</td>
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<th>Lab</th>
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<th>Admin. Unit</th>
<th>FICE Code</th>
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   | Level | 4 |

   b) Change to:

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</tr>
</tbody>
</table>

   | Level | 4 |

Approval recommended by:

[Signature]
Head of Department Date

Chair, College Review Committee Date

Head of Department (if cross-listed course) Date

Dean of College Date

Submitted to Coordinating Board by:

[Signature]
Director of Academic Support Services Date

Questions regarding this form should be directed to Sandra Williams at 845-8836.
OAR/AS – 04/07

30 of 33 G
ECEN 454 Digital Integrated Circuit Design

Text

References

Prerequisites
ELEN248 (Introduction to Digital Systems Design) or equivalents

Course Overview
This course provides a comprehensive introduction to modern digital integrated circuit design including topics such as VLSI fabrication, layout, MOS transistor device characteristics, interconnect, combinational and sequential circuits, timing & power issues, semiconductor memories, clock distribution. In the labs, students will gain hands-on design experience though the use of the state-of-art commercial design tools.

Lecture Agenda (tentative)
1. Introduction
2. CMOS circuits and basic design flow
3. Fabrication and layout
4. Transistor I-V characteristics and technology scaling
5. DC and transient circuit characteristics
6. Interconnect
7. SPICE simulation
8. Combinational logic circuits
9. Circuit optimization (gate sizing)
11. Sequential circuits
12. Static memory (SRAM)
13. Clock distribution and skew

Lab Description
The 454 labs are designed to provide students a basic exposure to modern digital VLSI design flows and design tools. A sequence of labs will cover: schematic capture and simulation, logic
design, custom layout, layout extraction and verification, SPICE and post-layout simulation, automatic place and route, timing analysis & verification, interconnect optimization. A final project will provide students the opportunity to perform custom digital IC design or get familiar with the entire ASIC design flow.

Lab Schedule (tentative)

1. Introduction to Cadence Schematic Capture and Simulation – [2nd week]
2. Advanced Logic Design – [3rd week]
3. Cadence Custom Layout – [4th week]
4. Layout Extraction and Verification – [5th week]
5. Cadence Custom Layout – Simulation – [6th week]
6. SPICE simulation – [7th week]
7. Automatic Place and Route – [8th week]
8. Timing Analysis – PrimeTime – [9th week]
9. Interconnect Delay Optimization-Buffer Insertion – [10th week]
11. Final lab project due in the last week of November

Grading

<table>
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<tr>
<th>Component</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Homework</td>
<td>10%</td>
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<tr>
<td>Mid-term</td>
<td>25%</td>
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<tr>
<td>Final Exam</td>
<td>35%</td>
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<tr>
<td>Labs</td>
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