REQUEST FOR ADDING, CHANGING, SUSPENDING OR DROPPING AN UNDERGRADUATE CONCENTRATION

Department: Division of Computer Science and Engineering
College: Engineering
Name of Concentration: Data Science and Analytics
Name of Curriculum/Major: Computer Science
Type of Degree: B.S.
Date: 10-11-17

Has this change been discussed with and approved by all departments/colleges affected? Yes (X) No ( ) N/A ( )

ATTACH JUSTIFICATION for all actions: Use separate sheet.
ATTACH RESPONSE from any departments affected [i.e. any department whose course(s) are to be added.]
ATTACH FORM D ADDENDUM for all new concentration or changes involving General Education courses.

ACTION (check appropriate box):

( ) ADDING: The entire new concentration, by semester, must be typed on plain sheets and attached to Form E. (See sample layout attached.)

( X ) CHANGING: Regardless if all semesters of a concentration are to be changed or only parts, the present and proposed (eight-semester) recommended path should be attached on separate pages. On the Present recommended path, use strikeout and on the Proposed recommended path, highlight areas to identify deletions and additions. Do not use boldface to designate changes as boldface is reserved for critical requirements within the recommended path. Explain all changes adequately on attachment.

( ) SUSPENDING: Provide an adequate explanation for suspending the concentration on plain sheets and attach.

( ) DROPPING: Provide an adequate explanation for dropping the concentration on plain sheets and attach.

CONCENTRATION

<table>
<thead>
<tr>
<th>PRESENT</th>
<th>PROPOSED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total semester hours in current concentration:</td>
<td>120</td>
</tr>
</tbody>
</table>

APPROVALS:

Department Faculty Approval Date: Sept 29, 2017
Department Chair’s Signature: 10/18/2017

College Faculty Approval Date: 11/11/17
College Dean's Signature: (Date)

Chair, FS C & C Committee Approval: 12/18/17
Academic Affairs Approval: (Date)

College/Division/Department Contact: Coretta Douglas
douglas@csc.lsu.edu
## GENERAL EDUCATION REQUIREMENTS

When a department adds a new curriculum or makes changes in an existing one, a Form D Addendum must also be submitted. This form is simply a list of those courses in the curriculum that satisfy the General Education requirement.

Include course rubric, number, and credit hours when curricula differ from the default values.

Indicate the curriculum semester for all General Education courses.

<table>
<thead>
<tr>
<th>General Education Requirement</th>
<th>Course(s)</th>
<th>Credit Hours</th>
<th>Curriculum Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>English Composition (6 hrs.)</td>
<td>ENGL 1001 or 1004</td>
<td>3</td>
<td>(X) 1st (5th)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(1st) 6th</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(3rd) 7th</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(4th) 8th</td>
</tr>
<tr>
<td></td>
<td>ENGL 2000</td>
<td>3</td>
<td>(1st) 5th</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(2nd) 6th</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(3rd) 7th</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(4th) 8th</td>
</tr>
<tr>
<td>Analytical Reasoning (6 hrs.)</td>
<td>General Education analytical reasoning course (from mathematics department)</td>
<td>3</td>
<td>(X) 1st (5th)</td>
</tr>
<tr>
<td>(At least 3 hours credit must be from a MATH course.)</td>
<td>MATH 1550</td>
<td></td>
<td>(2nd) 6th</td>
</tr>
<tr>
<td></td>
<td>General Education analytical reasoning course MATH 1552</td>
<td>3</td>
<td>(1st) 5th</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(X) 2nd (6th)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(3rd) 7th</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(4th) 8th</td>
</tr>
<tr>
<td>Arts (3 hrs.)</td>
<td>General Education arts course</td>
<td>3</td>
<td>(1st) 5th</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(2nd) 6th</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(3rd) 7th</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(4th) 8th</td>
</tr>
<tr>
<td>Humanities (9 hrs.)</td>
<td>General Education humanities course</td>
<td>3</td>
<td>(1st) 5th</td>
</tr>
<tr>
<td></td>
<td>Restricted: From CMST list</td>
<td></td>
<td>(2nd) 6th</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(3rd) 7th</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(X) 4th (8th)</td>
</tr>
<tr>
<td></td>
<td>General Education humanities course</td>
<td>3</td>
<td>(1st) 5th</td>
</tr>
<tr>
<td></td>
<td>Restricted: From ENGL or HNRS list at the 2000-level</td>
<td></td>
<td>(2nd) 6th</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(X) 3rd (7th)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(4th) 8th</td>
</tr>
<tr>
<td>Natural Sciences (9 hrs.)</td>
<td>General Education natural science course</td>
<td>3</td>
<td>(X) 1st (5th)</td>
</tr>
<tr>
<td>(If 2 course sequence is taken in the physical sciences, the additional 3 hour course must be from the life sciences, and vice versa.)</td>
<td>BIOL 1001 or BIOL 1201</td>
<td></td>
<td>(2nd) 6th</td>
</tr>
<tr>
<td></td>
<td>General Education natural science course</td>
<td>6</td>
<td>(X) 1st (5th)</td>
</tr>
<tr>
<td></td>
<td>(3 cr. hrs.) [Physical Science]</td>
<td></td>
<td>(2nd) 6th</td>
</tr>
<tr>
<td></td>
<td>Select from PHYS 1201 or PHYS 2001, or CHEM 1001 or CHEM 1201 or CHEM 1421 or ASTR 1101 or GEOL 1001 or GEOL 1003</td>
<td></td>
<td>(3rd) 7th</td>
</tr>
<tr>
<td></td>
<td>(3 cr. hrs.) A second science course must be selected to complete the sequence in either the BIOL science or physical science.</td>
<td></td>
<td>(X) 4th (8th)</td>
</tr>
<tr>
<td>Social Sciences (6 hrs.)</td>
<td>General Education social science course</td>
<td>3</td>
<td>(1st) 5th</td>
</tr>
<tr>
<td>(At least three hours at the 2000-level.)</td>
<td>General Education social science course (2000-level)</td>
<td></td>
<td>(2nd) 6th</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(3rd) 7th</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(4th) 8th</td>
</tr>
</tbody>
</table>
PROPOSED CHANGES – Data Science & Analytics (DSA) Concentration

(1) To reduce the required hours of science credits to align with the University General Education (GE) Natural Science requirements by dropping 3 cr. hrs.

(2) To increase the hours of required CSC credits by 3 cr. hrs.

(3) To permit credit in either CSC 2259 or EE 4740 on the CS degree audit

(4) To permit credit in either CSC 3501 or EE 3755 on the CS degree audit

(5) (Concentration: Data Science & Analytics) To convert a restricted DSA concentration area elective to a stricter CSC 4000-level and above elective.

JUSTIFICATION:

(1) Our computer science (CS) accreditation agency, ABET (abet.org), requires 30 cr. hrs. of combined mathematics and science. Currently all CS concentrations require additional hours over the minimum ABET requirement as well as more than the required LSU GE Natural Science requirements (9 cr. hrs.). The CSE faculty recognize that due to growth in the CS discipline, the majors would be better prepared for the workplace or graduate school having earned additional CS credits instead of superfluous science credits. Instead of requiring two science sequences, the science requirement will follow the university GE Natural Science requirements except that the list of approved science coursework is restricted. See Form E GE Addendum.

(2) We are increasing the total number of hours of required CSC coursework by adding 3 cr. hrs. of elective credit CSC 2000-level or above. CS is a broad field of study and the latest additions to the CSC course offerings are reflective of the growth in field: cybersecurity, cloud computing, data science and analytics. CS majors will benefit from additional content exposure from topics in such diverse elective areas. After reducing the science requirement by 3 cr. hrs., the increase in CSC cr. hrs. will maintain the total degree credits at 120 cr. hrs.

Furthermore, ABET requires a minimum of 40 cr. hrs. of computer science (CSC) coursework. Currently the concentration, CS & 2nd Discipline concentration requires only 42 credit hours of CSC coursework. Students pursuing the 2nd Discipline concentration will especially benefit from the additionally required CSC coursework.

(3) CSC 2259 Discrete Structures is a required course for all CS majors and for the CS minor.

a. See accompanying course change form C for CSC 2259. We are proposing to add the statement, “Credit will not be given for both this course and MATH 2020 or EE 4740.”

b. Furthermore, we are requesting that the 2018-2019 CS B.S. degree audit (all concentrations) and the CS minor be programmed to accept credit from either of the comparable courses: CSC 2259 or EE 4740. We are helping students who pursue dual majors, the CS minor or those students who change majors to CS to leverage overlapping credits.

The Mathematics Department has declined to accept CS majors in MATH 2020 classes as an alternative due to restricted faculty resources. We will continue to work individually with students who have earned credit in MATH 2020 [such as MATH majors] and are pursuing either a CS dual major or the CS minor for accommodations on an exception basis.
(4) CSC 3501 Computer Organization and Design is a required course for all CS majors and for the CS minor. The LSU Catalog prohibits credit in both CSC 3501 and EE 3755. We are requesting that the 2018-2019 CS B.S. degree audit and the CS minor be programmed to accept credit from either of the comparable courses: CSC 3501 or EE 3755. We are helping students who pursue dual majors, the CS minor or those students who change majors to CS to leverage overlapping credits.

(5) Currently the DSA concentration is a 6-course set of restricted coursework totaling 18 credit hours. Three of the courses (9 cr. hrs.) must be CSC course credits: CSC 2730, CSC 4402, and CSC 4740. The other three (9 cr. hrs.) restricted area electives are selected by the student; these courses may or may not be CSC with no more than 2 courses (6 cr. hrs.) from the same department. We are proposing one of the three restricted area elective courses be made a CSC 4000-level elective, leaving 6 cr. hrs. of the concentration which may be non-CSC credits. The additional CSC coursework is expected to better prepare the CS graduate for careers upon graduation. A similar change is proposed for the Software Engineering concentration. The Cloud Computing and Networking concentration currently requires 12 cr. hrs. of CSC coursework.

<table>
<thead>
<tr>
<th>CURRENT</th>
<th>Concentration: Data Science &amp; Analytics (9 cr. hrs. CSC)</th>
<th>CSC 2730, CSC 4402, 4740</th>
</tr>
</thead>
<tbody>
<tr>
<td>PROPOSED</td>
<td>Concentration: Data Science &amp; Analytics (12 cr. hrs. CSC)</td>
<td>CSC 2730, CSC 4402, 4740, *4+++</td>
</tr>
<tr>
<td></td>
<td>*Proposed 2018-2019 change to the DSA concentration</td>
<td></td>
</tr>
</tbody>
</table>

ABET Requirements: MATH + Science requirements
Total Credit Hours: 30

<table>
<thead>
<tr>
<th>Math Requirement at least 15 credit hours (1/2 year)</th>
<th>Current Science Requirements</th>
<th>Proposed Science Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Credit Hours: 19</td>
<td>Credit Hours: 14</td>
<td>Credit Hours: 11</td>
</tr>
<tr>
<td>CSC 2259 (3)</td>
<td>BIOL 1001 and 1002 (6)</td>
<td>(3 cr. hrs.) [Life Science]</td>
</tr>
<tr>
<td>MATH 1550 (5)</td>
<td>-or-</td>
<td>Select from BIOL 1001 or 1201 or HNRS 1007</td>
</tr>
<tr>
<td>MATH 1552 (4)</td>
<td>BIOL 1201 and 1202 (6)</td>
<td>(3 cr. hrs.) [Physical Science]</td>
</tr>
<tr>
<td>MATH 2090 (4)</td>
<td>Physical Science sequence (6)</td>
<td>Select from PHYS 1201 or 2001, or CHEM 1001 or CHEM 1201 or CHEM 1421 or ASTR 1101 or GEOL1001 or GEL 1003</td>
</tr>
<tr>
<td>IE 3302 (3)</td>
<td>From PHYS, CHEM, ASTR or GEOL</td>
<td>(3 cr. hrs.) A second course must be selected to complete the sequence in either the life science or physical science</td>
</tr>
<tr>
<td></td>
<td>2 cr. hrs. of science lab with either sequence chosen above</td>
<td>(2 cr. hrs.) Science laboratory credits are selected to accompany the sequence selected</td>
</tr>
<tr>
<td>Course</td>
<td>Title</td>
<td>Credit Hours</td>
</tr>
<tr>
<td>----------</td>
<td>--------------------------------------------</td>
<td>--------------</td>
</tr>
<tr>
<td>CSC 1200</td>
<td>Ethics in Computing</td>
<td>1</td>
</tr>
<tr>
<td>CSC 1350</td>
<td>Computer Science I for Majors (3 hr. lecture; 3 hr. lab)</td>
<td>4</td>
</tr>
<tr>
<td>CSC 1351</td>
<td>Computer Science II for Majors (3hr. lecture; 3 hr. lab)</td>
<td>4</td>
</tr>
<tr>
<td><strong>CSC 2+++</strong></td>
<td><strong>CSC 2000-level or above elective</strong></td>
<td><strong>3</strong> Proposed</td>
</tr>
<tr>
<td>CSC 2262</td>
<td>Numerical Methods</td>
<td>3</td>
</tr>
<tr>
<td>CSC 3102</td>
<td>Adv. Data Structures and Algorithm Analysis</td>
<td>3</td>
</tr>
<tr>
<td>CSC 3380</td>
<td>Object Oriented Design</td>
<td>3</td>
</tr>
<tr>
<td>CSC 3501</td>
<td>Computer Organization and Design</td>
<td>3</td>
</tr>
<tr>
<td>CSC 3+++</td>
<td>CSC 3000-level or above elective</td>
<td>3</td>
</tr>
<tr>
<td>CSC 4101</td>
<td>Programming Languages</td>
<td>3</td>
</tr>
<tr>
<td>103</td>
<td>Operating Systems</td>
<td>3</td>
</tr>
<tr>
<td>CSC 4330</td>
<td>Software Systems Development</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td><strong>Total CSC cr. hrs. (excluding CSC 2259)</strong></td>
<td><strong>36</strong></td>
</tr>
</tbody>
</table>

**Concentration: Second Discipline** (9 cr. hrs. CSC)
- CSC 2+++,
  - *4+++,* 4+++  
  "Proposed 2018-2019 change to the SEG concentration"

**Concentration: Cloud Computing & Networking** (12 cr. hrs. CSC)
- CSC 2610, 4402, 4501, 4601
  12 + 35 = 48

**Concentration: Data Science & Analytics** (12 cr. hrs. CSC)
- CSC 2730, CSC 4402, 4740, *4+++  
  "Proposed 2018-2019 change to the DSA concentration"

**Concentration: Software Engineering** (12 cr. hrs. of CSC)
- CSC 2+++; 4351, 4402, *4+++  
  "Proposed 2018-2019 change to the SEG concentration"

12 + 36 = 48

See CSC 2259 Form C this packet for CSC 2259 and EE 4740 syllabi.
CSC 3501 Computer Organization and Design

Fall 2017, Syllabus

Division of Computer Science and Engineering

Louisiana State University

Instructors: Kisung Lee


Catalog Course Description:
Computer arithmetic, design of high-speed adders and multipliers, CPU concepts, instruction fetching and decoding, hardwired control, microprogramming control, main memory, I/O organization, assembly language programming techniques, CPU instruction sets and addressing modes.

Prerequisites:
CSC 2259 Discrete Structures

Learning Objectives:
- Describe the basic computer architecture of modern microprocessors, memory organization, and systems terminology.
- Apply base conversion to convert between decimal, binary and hex integer formats.
- Apply understanding of binary arithmetic to perform integer arithmetic directly on binary numbers.
- Define pipelining and how definition leads to taken branches being costly.
- Apply ISA to design and test practical assembly routines on actual hardware, with inter-operation between C and assembly.
- Explain motivation and basic design of memory hierarchy.
- Define and determine if various examples display spatial and temporal locality.
- Apply cache understanding to solve problems such as: filling out cache tables, computing hit and miss rates, and/or writing a cache simulator.

Major Topics:
Overview of Computer Systems
Data Representations and Operations
Assembly Programming
Processor Architecture
Memory Hierarchy
Grading:
Exams and quizzes will account for 80% of grade, with assignments and class participation providing the balance. Grades are on a 10-point scale (i.e., 91-100 A+/A/A-, 81-90 B+/B/B-, 71-80 C+/C/C-, 61-70 D+/D/D-, <61 F). Plus/Minus grades will be uniformly distributed (e.g., 91-94 A-, 95-97 A, and 98-100 A+). If necessary, grading on a curve may be used. If a student misses any exam, a final grade of F will be given to the student. For each missed assignment of a student, the final grade of the student will be lowered by one grade (e.g., from A- to B+). Missed assignments include, but not limited to, empty code, meaningless code, and unrelated code.

Student Class Participation:
The class meets for a total of 3 hours per week, which constitutes a 3-hour credit course. While notes and reference materials may be posted via Moodle, the class is not designed as online-based; students are expected to attend class. Absences should be rare and exceptional. Students are expected to have read the assigned chapters or pages prior to class for the background necessary to properly participate in the discussion and think critically about the concepts addressed. As a general policy, for each hour you are in class, you (the student) should plan to spend at least two hours preparing for the next class. You should expect to spend around six to eight hours outside of class each week in activities such as reading, writing homework assignments, and/or completing programming-based exercises for the class.

Exams and Quizzes:
There will be two or three exams (one of which is the final). The final exam will be held on Wednesday, December 6, 2017 at 5:30PM-7:30PM, in the room in which we hold lectures. Other exam dates will be announced at least one week in advance. In addition, there will be quizzes that can occur during lectures. A grade of zero will be recorded for missed quizzes unless prior arrangements are made (only allowed in extraordinary circumstances).

Assignments:
There will be several programming assignments, and their due date will be announced at least one week in advance. Students are expected to be able to explain the workings of their own programs, and may be called upon to do so. If they cannot, no credit will be given for that assignment. Assignments turned in after the due date will be penalized 20% per day. Assignments that are submitted later than three days after the due date will result in a grade of zero.

Honesty Policy:
Students are encouraged to discuss programs in a general way to gain greater insight. Copying another's code, writing code for someone else, or allowing another to copy your code are cheating, and can result in a grade of zero for all parties. Therefore, take precautions so that your old printouts, unattended screen, etc. are not available to other students. Discussing the details of the solution or showing/examining actual code are not acceptable. If you are in doubt whether an activity is permitted collaboration or cheating, ask the instructor.
**Decorum:**
Students are expected to refrain from side conversation or other distracting behavior in class. Students should arrive on time for class; if late, come in quietly with a minimum of disturbance. Electronic communications (e.g., emailing, instant messaging, phone calls, facebooking, tweeting) are not allowed in class. During testing, any such communications may result in a grade of zero. Violations of this policy will be also reported to the Office of the Dean of Students.

**Email:**
Questions about lectures, assignments, and course organization may be sent to the professor or TA. We cannot guarantee an immediate response, but will address the issue through direct response, general announcement, or a suggestion to visit during office hours. Last minute questions (i.e., sent the night before an assignment is due) may not be answered before the deadline, so tackling problems early is encouraged.

**Regrading:**
If you believe we have made an error in grading your exam, quiz or assignment, you may submit the graded work along with a written request for reconsideration within seven days from the completion of grading. You must explain in writing clearly and succinctly the reasons your grade should be changed. In fairness to other students, we cannot vary the grading criteria on an individual basis, though suggestions may be taken into consideration for future classes.

**Disability:**
If you have a physical, psychological, medical or learning disability that may impact on your ability to carry out assigned course work, I would urge that you contact University Disability Services (DS), 115 Johnston Hall (225-578-5919, disability@lsu.edu, http://disability.lsu.edu/). Please bring a letter to me from the DS indicating your need for academic accommodations within the first week of class. The syllabus and other class materials can be made available in alternative format upon request.
14-Week Outline:

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
<th>Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Course Overview</td>
<td>Chap. 1</td>
</tr>
<tr>
<td></td>
<td>Bits and Bytes</td>
<td>Chap. 2.1</td>
</tr>
<tr>
<td>2</td>
<td>Integer Representations</td>
<td>Chap. 2.2</td>
</tr>
<tr>
<td>3</td>
<td>Integer Arithmetic</td>
<td>Chap. 2.3</td>
</tr>
<tr>
<td>4</td>
<td>Floating Point</td>
<td>Chap. 2.4</td>
</tr>
<tr>
<td>5</td>
<td>Machine Programs: Basics</td>
<td>Chap. 3.1-3.4</td>
</tr>
<tr>
<td></td>
<td>Machine Programs: Arithmetic</td>
<td>Chap. 3.5</td>
</tr>
<tr>
<td>6</td>
<td>Machine Programs: Control</td>
<td>Chap. 3.6</td>
</tr>
<tr>
<td>7</td>
<td>Machine Programs: Procedures</td>
<td>Chap. 3.7</td>
</tr>
<tr>
<td>8</td>
<td>Review and Midterm</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Machine Programs: Arrays</td>
<td>Chap. 3.8</td>
</tr>
<tr>
<td></td>
<td>Machine Programs: Structures</td>
<td>Chap. 3.9</td>
</tr>
<tr>
<td>10</td>
<td>Storage Technologies</td>
<td>Chap. 6.1</td>
</tr>
<tr>
<td></td>
<td>The Memory Hierarchy</td>
<td>Chap. 6.2-6.4</td>
</tr>
<tr>
<td>11</td>
<td>Cache Memories</td>
<td>Chap. 6.4-6.7</td>
</tr>
<tr>
<td>12</td>
<td>Cache Memories</td>
<td>Chap. 4.1-4.3</td>
</tr>
<tr>
<td></td>
<td>Instruction Set</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Architecture</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Sequential Implementation &amp; Pipelining</td>
<td>Chap. 4.3-4.4</td>
</tr>
<tr>
<td></td>
<td>Pipelined Implementation</td>
<td>Chap. 4.5</td>
</tr>
<tr>
<td>14</td>
<td>Review</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Final Exam</td>
<td></td>
</tr>
</tbody>
</table>
EE 3755 Computer Organization
Fall 2017

Instructor:
Sam Irving, email: sirvin1@lsu.edu
Roozbeh Karimi, email: rkarim2@lsu.edu

Class Time and Location:
4:30-7:20PM W 109 TUREAUD HALL

Office hours:
Sam Irving: 1:30–4:30PM W 201 EE Building (weeks 1-7)
Roozbeh Karimi: TBA (weeks 8+)

Course Description: Structure and organization of computer systems; instruction sets;
arithmetic; data path and control design.

Prerequisites: EE2740 or equivalent.

Text:
Interface, Author(s): David Patterson & John Hennessy,
  Release Date: 26 Sep 2013
  Imprint: Morgan Kaufmann
  Print Book ISBN: 9780124077263
  eBook ISBN :9780124078864

Optional Reference:
used in EE 2720, 2730, and 2740.)

Topics:
  1. Computer Abstractions and Technology
  2. Instructions
  3. Arithmetic for Computers
  4. Processor
  5. Logic Design and Verilog

Policy and Procedures:
Homework.
  o Students will submit homework individually in the following format:
    ▪ Begin each problem in a new page.
    ▪ Number the pages as follows: 1 of 5, 2 of 5, ... , 5 of 5.
    ▪ The problems should be submitted in the same order as in the
      assignment.
    ▪ Staple the pages and fold them vertically.
    ▪ Write your name on the outside.
    ▪ In order to encourage you to follow the instructions given above, 2 points
      will be deducted for each of the instructions which are not followed.
The student will be given the opportunity to submit late homework until the second class after the homework's due date. Late homework will be penalized 10% of the original maximum grade for each day it is late.

All homework assignments are due at the end of classes.

Exams.

All exams will be closed notes.

Quizzes and classroom assignments

There will be quizzes or group class assignments and they may be in the beginning, middle or end of the class.

Test, homework, quiz, classroom assignment, and laboratory report grading.

If you believe an error was made in grading your assignment, you should write a short justification of your claim and attach it to the original assignment. Hand it to your instructor or slide it under his office door within one week of it being returned to you.

Make-ups on Exams and Quizzes.

If you miss an exam or quiz without either a medical excuse or prior instructor approval, you will not be given a make-up.

Grading:

- Homework, Quizzes and Classroom Assignments: 15%
- 1 Midterm Test – Oct. 4th, Wednesday in class: 35%
- Final – M Dec. 4, 5:30 - 7:30 PM: 50%

Grading Scale:

- A+ ≥ 97, A ≥ 93, A- ≥ 90
- B+ ≥ 87, B ≥ 83, B- ≥ 80
- C+ ≥ 77, C ≥ 73, C- ≥ 70
- D+ ≥ 67, D ≥ 63, D- ≥ 60
- F < 60

Plus/Minus Grades Guidance
https://sites01.lsu.edu/wp/registraroffice/academics/plusminus-grades-guidelines/

Curving:

At the discretion of the instructor a grading curve may be used to allow for a more favorable grade distribution
Recommended Path
Data Science and Analytics Concentration

CURRENT
Critical Path 2017-2018
Data Science and Analytics

CRITICAL REQUIREMENTS

SEMESTER 1: MATH 1021.

SEMESTER 2: "C" or better in ENGL 1001.

SEMESTER 3: "C" or better in MATH 1550 /MATH 1551.

SEMESTER 4: "C" or better in CSC 2259.

SEMESTER 5: MATH 2090.

A grade of "C" or better is required in all CSC prerequisite courses; CSC 1200, CSC 4101, CSC 4103 and CSC 4330; MATH 1550 and MATH 1552; BIOL 1001 or BIOL 1201 and all science prerequisite courses including laboratory courses.

Semester 1

- CRITICAL: MATH 1021.

- CSC 1350 Computer Science I for Majors (4)
- ENGL 1001 English Composition (3)
- MATH 1550 Analytic Geometry and Calculus I (5)
- General Education course - Natural Sciences (3)

Total Semester Hours: 15

PROPOSED
Critical Path 2018-2019
Data Science and Analytics (DSA)

CRITICAL REQUIREMENTS

SEMESTER 1: MATH 1021.

SEMESTER 2: "C" or better in ENGL 1001.

SEMESTER 3: "C" or better in MATH 1550 /MATH 1551.

SEMESTER 4: "C" or better in CSC 2259.

SEMESTER 5: MATH 2090.

A grade of "C" or better is required in all CSC prerequisite courses; CSC 3200, CSC 4101, CSC 4103 and CSC 4330; MATH 1550 and MATH 1552; BIOL 1001 or BIOL 1201 and all science prerequisite courses including laboratory courses.

Semester 1

- CRITICAL: MATH 1021.

- CSC 1350 Computer Science I for Majors (4)
- ENGL 1001 English Composition (3)
- MATH 1550 Analytic Geometry and Calculus I (5)
- General Education course - Natural Sciences (3)

Total Semester Hours: 15
Semester 2

- **CRITICAL**: “C” or better in ENGL 1001.
- **CSC 1351 Computer Science II for Majors (4)**
- **MATH 1552 Analytic Geometry and Calculus II (4)**
- General Education course - Natural Sciences (3)\(^1\)
- General Education course - Humanities (English/Honors 2000-level) (3)
- General Education course - Humanities (Communication Studies course) (3)

*Total Semester Hours: 17*

Semester 3

- **CRITICAL**: “C” or better in MATH 1550/ MATH 1551.
- **CSC 2259 Discrete Structures (3)**
- **CSC 3102 Advanced Data Structures and Algorithm Analysis (3)**
- **MATH 2090 Elementary Differential Equations and Linear Algebra (4)**
- General Education course - Natural Sciences (3)\(^1\)
- General Education course - Natural Sciences Lab (1)\(^1\)
- General Education course - Humanities (3)

*Total Semester Hours: 17*
Semester 4

- **CRITICAL**: “C” or better in CSC 2259.
- 
- **CSC 2262 Numerical Methods (3)**
- **CSC 3501 Computer Organization and Design (3)**
- **CSC 4103 Operating Systems (3)**
- **ENGL 2000 English Composition (3)**
- General Education Course - Natural Sciences (3)*
- General Education Course - Natural Sciences Lab (1)*

**Total Semester Hours: 16**

Semester 5

- **CRITICAL**: MATH 2090.
- 
- **CSC 4402 Database Systems (3)**
- **CSC 2730 Data Science and Analytics (3)**
- **IE 3302 Engineering Statistics (3)**
- Approved Area Elective (3)*
- Approved Technical Elective (3)*

**Total Semester Hours: 15**

Semester 6

- **CSC 4740 Big Data Technologies (3)**
- **CSC 3380 Object Oriented Design (3)**
- Approved Area Elective (3)*
- General Education Course - Social Sciences (3)
- Approved Technical Elective (3)*

**Total Semester Hours: 15**
**Semester 7**

- CSC 3200 Ethics in Computing (1)
- [CSC 4330 Software Systems Development (3)](#)
- [CSC 4101 Programming Languages (3)](#)
- Approved Area Elective (3)$^2$
- General Education Course - Social Sciences (2000-Level) (3)

**Total Semester Hours: 13**

**Semester 8**

- [CSC (3000-Level or above) Elective (3)$^2$](#)
- Approved Elective (6)
- General Education Course - Arts (3)

**Total Semester Hours: 12**

120 Total Sem. Hrs.

---

**Semester 7**

- CSC 3200 Ethics in Computing (1)
- [CSC 4330 Software Systems Development (3)](#)
- [CSC 4101 Programming Languages (3)](#)
- Approved DSA Area Elective (3)$^2$
- General Education Course - Social Sciences (2000-Level) (3)

**Total Semester Hours: 13**

**Semester 8**

- [CSC (2000-Level or above) Elective (3)$^3$](#)
- [CSC (3000-Level or above) Elective (3)$^3$](#)
- Approved Elective (6)
- General Education Course - Arts (3)

**Total Semester Hours: 15**

120 Total Sem. Hrs.
Computer science students are cautioned to verify course descriptions in the catalog noting where duplication of course credits may be prohibited. Additionally, computer science students will not receive degree credit for the following courses: **CSC 1240; ELRC 4006; EXST 2201; ISDS 2000, ISDS 2001, ISDS 2010, ISDS 2011, ISDS 3070, ISDS 3075; PSYC 4111; and SOCL 2201.**

1 - For General Education Natural Science, two six-hour sequences in both physical and life sciences must be taken; one sequence must include two additional hours of lab work. One sequence must be from the Biological Sciences (BIOL) and the physical-science sequence selected from Astronomy, Chemistry, Geology and Physics.

2 - **APPROVED AREA ELECTIVES** (9 hours required): No more than two courses (6 hours) from the same department: **CSC 4501, CSC 4512, CSC 4610; EE 3150; IE 3302; ISDS 3105, ISDS 4118, ISDS 4141; MATH 3355, MATH 4024, MATH 4025;** other electives subject to approval. The selection of the CSC (3000-level or above) elective is not restrictive to topics related to Data Analytics.

3 - **APPROVED DSA AREA ELECTIVES** (6 hours required): **CSC 4501, CSC 4512, CSC 4610; EE 3150; IE 3302; ISDS 3105, ISDS 4118, ISDS 4141; MATH 3355, MATH 4024, MATH 4025;** other electives subject to approval.

3 - The selection of the CSC 2000-level or above elective (3 cr. hrs.) and 3000-level or above elective (3 cr. hrs.) is not restrictive to topics related to data science and analytics.
3. APPROVED TECHNICAL ELECTIVES: Three hours of elective credits must be selected from Group A and three hours of elective credits selected from Group A or Group B.

GROUP A: 2000-level and above only chosen from CSC, BE, CHE, CE, CM, EE, ENGR, EVEG, IE, ME, PETE, EMS, ENVCS, OCS, MATH, ECON, FIN, ASTR, BIOL, CHEM, GEOG, GEOL, PHYS, ISDS 3100, ISDS 3105, ISDS 3120.

GROUP B: ART 2050, ART 2055, ART 2551, ART 4020, ART 4050, ART 4055, ART 4550, ART 4059, ART 4560, ARTH 4466, ARTH 4468, ARTH 4480, ARTH 4482, ARTH 4484, MC 4015, MC 4260, MUS 2745, MUS 4745, MUS 4746, ENGL 2009, ENGL 2231, ENGL 4000, ENGL 4009, ENGL 7109.

4. Students who have completed the prerequisites may substitute MATH 3355 or EE 3180 or EXST 4050 for IE 3302.

4. APPROVED TECHNICAL ELECTIVES: Three hours of elective credits must be selected from Group A and three hours of elective credits selected from Group A or Group B.

GROUP A: 2000-level and above only chosen from CSC, BE, CHE, CE, CM, EE, ENGR, EVEG, IE, ME, PETE, EMS, ENVCS, OCS, MATH, ECON, FIN, ASTR, BIOL, CHEM, GEOG, GEOL, PHYS, ISDS 3100, ISDS 3105, ISDS 3120.

GROUP B: ART 2050, ART 2055, ART 2551, ART 4020, ART 4050, ART 4055, ART 4550, ART 4059, ART 4560, ARTH 4466, ARTH 4468, ARTH 4480, ARTH 4482, ARTH 4484, MC 4015, MC 4260, MUS 2745, MUS 4745, MUS 4746, ENGL 2009, ENGL 2231, ENGL 4000, ENGL 4009, ENGL 7109.

5. Credit will not be applied to the degree for courses with overlapping content. For clarification, contact the division’s academic adviser. Students who have completed the prerequisites may substitute:

EE 4740 for CSC 2259 but not both
EE 3755 for CSC 3501 but not both
MATH 3355 or EE 3180 or EXST 4050 for IE 3302.
TOTAL HOURS = 120

COMPUTER SCIENCE

FALL 1
- CSC 1350 Intro to CS I for Majors
- MATH 1550 Calc I

SPRING 2
- CSC 1351 Intro to CS II for Majors
- MATH 1552 Calc II

FALL 3
- CSC 3102 Adv Data Str
- CSC 2269 Discrete Structures

SPRING 4
- CSC 4033 Op Sys
- CSC 3501 Comp Org & Design

FALL 5
- CSC 4402 DB Mgt Sys (DSA)
- CSC 2730 Data Sci & Analytics (DSA)

SPRING 6
- CSC 3880 OO Design
- CSC 4740 Big Data Tech (DSA)

FALL 7
- CSC 4330 Software Sys
- CSC 3200 Ethics in Computing

SPRING 8
- CSC 3441 Prog Lang
- Approved Elective

HOURS: 15 15 17 15 15 15 = 120

FLOWCHART LEGEND

C Grade of "C" or better required BEFORE enrolling in next course in the sequence.

Gen Ed General Education; see 2017-2018 General Catalog

OFFICE: 3325 Patrick F. Taylor Hall

* See CSC & E Division for approved list and substitutions; in general:
  Group A: STEM 2000 level and above;
  Group B: AVATAR DM Art-track electives

** Pre-approved concentration area electives: CSC 4501, 4512, 4610; EE 3150;
IE 3302; ISDS 3105, 4118, 4141; MATH 3355, 4024, 4025; other electives
subject to approval
Date: Wed, 25 Oct 2017 17:02:24 +0000
From: John D Scalzo <jscalz1@lsu.edu>
To: Coretta Douglas <douglas@csc.lsu.edu>
Subject: RE: Response Requested - Curriculum Change RE: CSC 3501 & EE 3755

ECE approves of this substantiation.

John Scalzo, MSEE  
Senior Instructor, Undergraduate Adviser  
Division of Electrical and Computer Engineering  
Louisiana State University  
102 South Campus Drive 150-E, Baton Rouge , LA 70803  
office 225-578-5478  
www.ece.lsu.edu/fac/Scalzo.html

-----Original Message-----
From: Coretta Douglas [mailto:douglas@csc.lsu.edu]
Sent: Wednesday, October 18, 2017 12:54 PM  
To: John D Scalzo <jscalz1@lsu.edu>
Cc: Busch, Konstantin <busch@csc.lsu.edu>; Jerry L Trahan <jtrahan@lsu.edu>
Subject: CSE: Response Requested - Curriculum Change RE: CSC 3501 & EE 3755

Dear John,
CSE is proposing curriculum changes that involve credit in EE 3755 applied toward the (1) computer science major and the (2) computer science minor. A timely response from the Division of Electrical and Computer Engineering is needed.

Please respond with either favorable reply (approved) or with substantiation if you object to the 2 changes.
(1) We have been informed by ABET (abet.org) that the computer science curriculum is not restricted to a minimum of 40 credit hours of CSC coursework. ABET instead requires at least 40 cr. hrs. of computer science "subject content"; we have the flexibility to substitute other department's coursework that covers the content of the CSC equivalent.
Currently, for CS majors with earned credit in EE 3755, we require a computer science (CSC) course CSC 3000-level and above to substitute for CSC 3501. The requirement was needed to ensure that CS majors, particularly in the 2nd Discipline concentration, had the minimum of 40 cr. hrs. of CSC coursework.
With approval of the proposed change, the degree audits (all concentrations) will be programmed to permit credit in either CSC 3501 or EE 3755. The LSU General Catalog states that students may not receive credit for both CSC 3501 and EE 3755.

(2) CSC 3501 is required for the minor in computer science. After manual review, by the CSE academic adviser, a counselor in the College of Engineering is informed of the approved substitution EE 3755 for CSC 3501 in the declared computer science minor. The Counselor then must manually make the change to the student's degree audit. We
are making the substitution explicit in the LSU General Catalog description for the computer science minor.

See attached documents.

Regards,
Coretta

Coretta Douglas, Ph.D. Computer Science
Undergraduate/Instructional Coordinator and Instructor
Patrick F. Taylor 3270-A
** Division of Computer Science and Engineering **
School of Electrical Engineering and Computer Science
7/91
REQUEST FOR ADDING, CHANGING, SUSPENDING OR DROPPING AN UNDERGRADUATE CONCENTRATION

Department: Division of Computer Science and Engineering
College: Engineering
Name of Concentration: Software Engineering
Name of Curriculum/Major: Computer Science
Type of Degree: B.S.

Has this change been discussed with and approved by all departments/colleges affected? Yes (X) No ( ) N/A ( )

ATTACH JUSTIFICATION for all actions: Use separate sheet.
ATTACH RESPONSE from any departments affected [i.e. any department whose course(s) are to be added.]
ATTACH FORM D ADDENDUM for all new concentration or changes involving General Education courses.

ACTION (check appropriate box):

( ) ADDING: The entire new concentration, by semester, must be typed on plain sheets and attached to Form E. (See sample layout attached.)
( ) CHANGING: Regardless if all semesters of a concentration are to be changed or only parts, the present and proposed (eight-semester) recommended path should be attached on separate pages. On the Present recommended path, use strikeout and on the Proposed recommended path, highlight areas to identify deletions and additions. Do not use boldface to designate changes as boldface is reserved for critical requirements within the recommended path. Explain all changes adequately on attachment.
( ) SUSPENDING: Provide an adequate explanation for suspending the concentration on plain sheets and attach.
( ) DROPPING: Provide an adequate explanation for dropping the concentration on plain sheets and attach.

CONCENTRATION

<table>
<thead>
<tr>
<th>PRESENT</th>
<th>PROPOSED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total semester hours in current concentration: 120</td>
<td>Total semester hours in proposed concentration: 120</td>
</tr>
</tbody>
</table>

APPROVALS:
Department Faculty Approval Date: Sept 29, 2017
Department Chair’s Signature: [Signature]
Date: [Date]

College Faculty Approval Date: [Date]
College Dean’s Signature: [Signature]
Date: [Date]

Chair, FS C & C Committee: [Signature]
Date: [Date]

Academic Affairs Approval: [Signature]
Date: [Date]

College/Division/Department Contact: Coretta Douglas
Contact E-mail: douglas@csc.lsu.edu
## GENERAL EDUCATION REQUIREMENTS

When a department adds a new curriculum or makes changes in an existing one, a Form D Addendum must also be submitted. This form is simply a list of those courses in the curriculum that satisfy the General Education requirement.

Include course rubric, number, and credit hours when curricula differ from the default values.

Indicate the curriculum semester for all General Education courses.

<table>
<thead>
<tr>
<th>General Education Requirement</th>
<th>Course(s)</th>
<th>Credit Hours</th>
<th>Curriculum Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>English Composition (6 hrs.)</strong></td>
<td>ENGL 1001 or 1004</td>
<td>3</td>
<td>(X) 1st (X) 5th</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(2nd) (X) 6th</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(3rd) (X) 7th</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(4th) (X) 8th</td>
</tr>
<tr>
<td></td>
<td>ENGL 2000</td>
<td>3</td>
<td>(1st) (X) 5th</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(2nd) (X) 6th</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(3rd) (X) 7th</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(4th) (X) 8th</td>
</tr>
<tr>
<td><strong>Analytical Reasoning (6 hrs.)</strong></td>
<td>General Education analytical reasoning course (from mathematics department)</td>
<td>3</td>
<td>(X) 1st (X) 5th</td>
</tr>
<tr>
<td>(At least 3 hours credit must be from a MATH course.)</td>
<td>MATH 1550</td>
<td></td>
<td>(2nd) (X) 6th</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(3rd) (X) 7th</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(4th) (X) 8th</td>
</tr>
<tr>
<td><strong>Arts</strong> (3 hrs.)</td>
<td>General Education arts course</td>
<td>3</td>
<td>(1st) (X) 5th</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(2nd) (X) 6th</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(3rd) (X) 7th</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(4th) (X) 8th</td>
</tr>
<tr>
<td><strong>Humanities</strong> (9 hrs.)</td>
<td>General Education humanities course</td>
<td>3</td>
<td>(1st) (X) 5th</td>
</tr>
<tr>
<td></td>
<td><strong>Restricted: From CMST list</strong></td>
<td></td>
<td>(2nd) (X) 6th</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(3rd) (X) 7th</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(4th) (X) 8th</td>
</tr>
<tr>
<td><strong>Natural Sciences</strong> (9 hrs.)</td>
<td>General Education humanities course</td>
<td>3</td>
<td>(1st) (X) 5th</td>
</tr>
<tr>
<td>(If 2 course sequence is taken in the physical sciences, the additional 3 hour course must be from the life sciences, and vice versa.)</td>
<td><strong>Restricted: From ENGL or HNRS list at the 2000-level</strong></td>
<td></td>
<td>(2nd) (X) 6th</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(3rd) (X) 7th</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(4th) (X) 8th</td>
</tr>
<tr>
<td><strong>Social Sciences</strong> (6 hrs.)</td>
<td>General Education social science course</td>
<td>3</td>
<td>(1st) (X) 5th</td>
</tr>
<tr>
<td>(At least three hours at the 2000-level.)</td>
<td>General Education social science course (2000-level)</td>
<td></td>
<td>(2nd) (X) 6th</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(3rd) (X) 7th</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(4th) (X) 8th</td>
</tr>
</tbody>
</table>
PROPOSED CHANGES –Software Engineering (SEG) Concentration

(1) To reduce the required hours of science credits to align with the University General Education (GE) Natural Science requirements by dropping 3 cr. hrs.

(2) To increase the hours of required CSC credits by 3 cr. hrs.

(3) To permit credit in either CSC 2259 or EE 4740 on the CS degree audit

(4) To permit credit in either CSC 3501 or EE 3755 on the CS degree audit

(5) (Concentration: Software Engineering) To convert a restricted SEG concentration area elective to a stricter CSC 4000-level and above elective.

JUSTIFICATION:

(1) Our computer science (CS) accreditation agency, ABET (abet.org), requires 30 cr. hrs. of combined mathematics and science. Currently all CS concentrations require additional hours over the minimum ABET requirement as well as more than the required LSU GE Natural Science requirements (9 cr. hrs.). The CSE faculty recognize that due to growth in the CS discipline, the majors would be better prepared for the workplace or graduate school having earned additional CS credits instead of superfluous science credits. Instead of requiring two science sequences, the science requirement will follow the university GE Natural Science requirements except that the list of approved science coursework is restricted. See Form E GE Addendum.

(2) We are increasing the total number of hours of required CSC coursework by adding 3 cr. hrs. of elective credit CSC 2000-level or above. CS is a broad field of study and the latest additions to the CSC course offerings are reflective of the growth in field: cybersecurity, cloud computing, data science and analytics. CS majors will benefit from additional content exposure from topics in such diverse elective areas. After reducing the science requirement by 3 cr. hrs., the increase in CSC cr. hrs. will maintain the total degree credits at 120 cr. hrs.

Furthermore, ABET requires a minimum of 40 cr. hrs. of computer science (CSC) coursework. Currently the concentration, CS & 2nd Discipline concentration requires only 42 credit hours of CSC coursework. Students pursuing the 2nd Discipline concentration will especially benefit from the additionally required CSC coursework.

(3) CSC 2259 Discrete Structures is a required course for all CS majors and for the CS minor.
   a. See accompanying course change form C for CSC 2259. We are proposing to add the statement, “Credit will not be given for both this course and MATH 2020 or EE 4740.”

   b. Furthermore, we are requesting that the 2018-2019 CS B.S. degree audit (all concentrations) and the CS minor be programmed to accept credit from either of the comparable courses: CSC 2259 or EE 4740. We are helping students who pursue dual majors, the CS minor or those students who change majors to CS to leverage overlapping credits.

The Mathematics Department has declined to accept CS majors in MATH 2020 classes as an alternative due to restricted faculty resources. We will continue to work individually with students who have earned credit in MATH 2020 [such as MATH majors] and are pursuing either a CS dual major or the CS minor for accommodations on an exception basis.
(4) CSC 3501 Computer Organization and Design is a required course for all CS majors and for the CS minor. The LSU Catalog prohibits credit in both CSC 3501 and EE 3755. We are requesting that the 2018-2019 CS B.S. degree audit and the CS minor be programmed to accept credit from either of the comparable courses: CSC 3501 or EE 3755. We are helping students who pursue dual majors, the CS minor or those students who change majors to CS to leverage overlapping credits.

(5) Currently the SEG concentration is a 6-course set of restricted coursework totaling 18 credit hours. Three of the courses (9 cr. hrs.) must be CSC course credits: CSC 2000-level and above, CSC 4351 and CSC 4402. The other three (9 cr. hrs.) restricted area electives are selected by the student; these courses may or may not be CSC with a maximum of 6 credit hours from ISDS applied to the degree. We are proposing one of the three restricted area elective courses be made a CSC 4000-level elective, leaving 6 cr. hrs. of the concentration which may be non-CSC credits. The additional CSC coursework is expected to better prepare the CS graduate for careers upon graduation. A similar change is proposed for the Data Science and Analytics concentration. The Cloud Computing and Networking concentration currently requires 12 cr. hrs. of CSC coursework.

<table>
<thead>
<tr>
<th>CURRENT</th>
<th>Concentration: Software Engineering (9 cr. hrs. of CSC)</th>
<th></th>
<th>PROPOSED</th>
<th>Concentration: Software Engineering (12 cr. hrs. of CSC)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CSC 2++, 4351, 4402</td>
<td></td>
<td>CSC 2++, 4351, 4402, *4+++</td>
<td></td>
</tr>
<tr>
<td></td>
<td>*Proposed 2018-2019 change to the SEG concentration</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**ABET Requirements: MATH + Science requirements**

Total Credit Hours: 30

<table>
<thead>
<tr>
<th>Math Requirement at least 15 credit hours (1/2 year)</th>
<th>Current Science Requirements</th>
<th>Proposed Science Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Credit Hours: 19</td>
<td>Credit Hours: 14</td>
<td>Credit Hours: 11</td>
</tr>
<tr>
<td>CSC 2259 (3)</td>
<td>BIOL 1001 and 1002 (6)</td>
<td>(3 cr. hrs.) [Life Science]</td>
</tr>
<tr>
<td>MATH 1550 (5)</td>
<td>-or-</td>
<td>Select from BIOL 1001 or 1201</td>
</tr>
<tr>
<td>MATH 1552 (4)</td>
<td>BIOL 1201 and 1202 (6)</td>
<td>or HNRS 1007</td>
</tr>
<tr>
<td>MATH 2090 (4)</td>
<td>Physical Science sequence (6)</td>
<td>(3 cr. hrs.) [Physical Science]</td>
</tr>
<tr>
<td>IE 3302 (3)</td>
<td>From PHYS, CHEM, ASTR or GEOL</td>
<td>Select from PHYS 1201 or 2001,</td>
</tr>
<tr>
<td></td>
<td>2 cr. hrs. of science lab with</td>
<td>CHEM 1001 or CHEM 1201 or CHEM</td>
</tr>
<tr>
<td></td>
<td>either sequence chosen above</td>
<td>1421 or ASTR 1101 or GEOL1001</td>
</tr>
<tr>
<td></td>
<td></td>
<td>or GEL 1003</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(3 cr. hrs.) A second course must be</td>
</tr>
<tr>
<td></td>
<td></td>
<td>selected to complete the sequence in</td>
</tr>
<tr>
<td></td>
<td></td>
<td>either the life science or physical science</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2 cr. hrs.) Science laboratory credits are</td>
</tr>
<tr>
<td></td>
<td></td>
<td>selected to accompany the sequence</td>
</tr>
<tr>
<td></td>
<td></td>
<td>selected</td>
</tr>
</tbody>
</table>
## PROPOSED: REQUIRED ALL CONCENTRATIONS

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSC 1200</td>
<td>Ethics in Computing</td>
<td>1</td>
</tr>
<tr>
<td>CSC 1350</td>
<td>Computer Science I for Majors (3 hr. lecture; 3 hr. lab)</td>
<td>4</td>
</tr>
<tr>
<td>CSC 1351</td>
<td>Computer Science II for Majors (3 hr. lecture; 3 hr. lab)</td>
<td>4</td>
</tr>
<tr>
<td><strong>CSC 2+++</strong></td>
<td><strong>CSC 2000-level or above elective</strong></td>
<td><strong>3</strong> Proposed</td>
</tr>
<tr>
<td>CSC 2262</td>
<td>Numerical Methods</td>
<td>3</td>
</tr>
<tr>
<td>CSC 3102</td>
<td>Adv. Data Structures and Algorithm Analysis</td>
<td>3</td>
</tr>
<tr>
<td>CSC 3380</td>
<td>Object Oriented Design</td>
<td>3</td>
</tr>
<tr>
<td>CSC 3501</td>
<td>Computer Organization and Design</td>
<td>3</td>
</tr>
<tr>
<td>CSC 3+++</td>
<td>CSC 3000-level or above elective</td>
<td>3</td>
</tr>
<tr>
<td>CSC 4101</td>
<td>Programming Languages</td>
<td>3</td>
</tr>
<tr>
<td>103</td>
<td>Operating Systems</td>
<td>3</td>
</tr>
<tr>
<td>CSC 4330</td>
<td>Software Systems Development</td>
<td>3</td>
</tr>
</tbody>
</table>

**Total CSC cr. hrs. (excluding CSC 2259)** 36

**Concentration: Second Discipline** (9 cr. hrs. CSC)

*Proposed 2018-2019 change to the SEG concentration

9 + 36 = **45**

**Concentration: Cloud Computing & Networking** (12 cr. hrs. CSC)

CSC 2610, 4402, 4501, 4601

12 + 36 = **48**

**Concentration: Data Science & Analytics** (12 cr. hrs. CSC)

CSC 2730, 4402, 4740, *4+++,

*Proposed 2018-2019 change to the DSA concentration

12 + 36 = **48**

**Concentration: Software Engineering** (12 cr. hrs. of CSC)

CSC 2+++ 4351, 4402, *4+++,

*Proposed 2018-2019 change to the SEG concentration

12 - 36 = **48**

See CSC 2259 Form C this packet for CSC 2259 and EE 4740 syllabi.
See CSC 2259 Form C this packet for CSC 2259 and EE 4740 syllabi.
CSC 3501 Computer Organization and Design

*Fall 2017, Syllabus*
Division of Computer Science and Engineering
Louisiana State University

**Instructors:** Kisung Lee  
**Textbook:** *Computer Systems: A Programmer's Perspective*, second edition by Randal E. Bryant and David R. O'Hallaron (required)

**Catalog Course Description:**  
Computer arithmetic, design of high-speed adders and multipliers, CPU concepts, instruction fetching and decoding, hardwired control, microprogramming control, main memory, I/O organization, assembly language programming techniques, CPU instruction sets and addressing modes.

**Prerequisites:**  
CSC 2259 Discrete Structures

**Learning Objectives:**  
- Describe the basic computer architecture of modern microprocessors, memory organization, and systems terminology.  
- Apply base conversion to convert between decimal, binary and hex integer formats.  
- Apply understanding of binary arithmetic to perform integer arithmetic directly on binary numbers.  
- Define pipelining and how definition leads to taken branches being costly.  
- Apply ISA to design and test practical assembly routines on actual hardware, with inter-operation between C and assembly.  
- Explain motivation and basic design of memory hierarchy.  
- Define and determine if various examples display spatial and temporal locality.  
- Apply cache understanding to solve problems such as: filling out cache tables, computing hit and miss rates, and/or writing a cache simulator.

**Major Topics:**  
Overview of Computer Systems  
Data Representations and Operations  
Assembly Programming  
Processor Architecture  
Memory Hierarchy

**Grading:**  
Exams and quizzes will account for 80% of grade, with assignments and class participation providing the balance. Grades are on a 10-point scale (i.e., 91-100 A+/A/A-, 81-90 B+/B/B-, 71-80 C+/C/C-, 61-70 D+/C/C-, <61 F). Plus/Minus grades will be uniformly distributed (e.g., 91-94 A-, 95-97 A, and 98-100 A+). If necessary, grading on a curve may be used. If a student misses any exam, a final grade of F will be given to the student. For each missed assignment of a student, the final grade of the student will be lowered by one grade (e.g., from A- to B+). Missed assignments include, but not limited to, empty code, meaningless code, and unrelated code.
Student Class Participation:
The class meets for a total of 3 hours per week, which constitutes a 3-hour credit course. While notes and reference materials may be posted via Moodle, the class is not designed as online-based; students are expected to attend class. Absences should be rare and exceptional. Students are expected to have read the assigned chapters or pages prior to class for the background necessary to properly participate in the discussion and think critically about the concepts addressed. As a general policy, for each hour you are in class, you (the student) should plan to spend at least two hours preparing for the next class. You should expect to spend around six to eight hours outside of class each week in activities such as reading, writing homework assignments, and/or completing programming-based exercises for the class.

Exams and Quizzes:
There will be two or three exams (one of which is the final). The final exam will be held on Wednesday, December 6, 2017 at 5:30PM-7:30PM, in the room in which we hold lectures. Other exam dates will be announced at least one week in advance. In addition, there will be quizzes that can occur during lectures. A grade of zero will be recorded for missed quizzes unless prior arrangements are made (only allowed in extraordinary circumstances).

Assignments:
There will be several programming assignments, and their due date will be announced at least one week in advance. Students are expected to be able to explain the workings of their own programs, and may be called upon to do so. If they cannot, no credit will be given for that assignment. Assignments turned in after the due date will be penalized 20% per day. Assignments that are submitted later than three days after the due date will result in a grade of zero.

Honesty Policy:
Students are encouraged to discuss programs in a general way to gain greater insight. Copying another's code, writing code for someone else, or allowing another to copy your code are cheating, and can result in a grade of zero for all parties. Therefore, take precautions so that your old printouts, unattended screen, etc. are not available to other students. Discussing the details of the solution or showing/examining actual code are not acceptable. If you are in doubt whether an activity is permitted collaboration or cheating, ask the instructor.

Decorum:
Students are expected to refrain from side conversation or other distracting behavior in class. Students should arrive on time for class; if late, come in quietly with a minimum of disturbance. Electronic communications (e.g., emailing, instant messaging, phone calls, facebooking, tweeting) are not allowed in class. During testing, any such communications may result in a grade of zero. Violations of this policy will be also reported to the Office of the Dean of Students.
Email:
Questions about lectures, assignments, and course organization may be sent to the professor or TA. We cannot guarantee an immediate response, but will address the issue through direct response, general announcement, or a suggestion to visit during office hours. Last minute questions (i.e., sent the night before an assignment is due) may not be answered before the deadline, so tackling problems early is encouraged.

Regrading:
If you believe we have made an error in grading your exam, quiz or assignment, you may submit the graded work along with a written request for reconsideration within seven days from the completion of grading. You must explain in writing clearly and succinctly the reasons your grade should be changed. In fairness to other students, we cannot vary the grading criteria on an individual basis, though suggestions may be taken into consideration for future classes.

Disability:
If you have a physical, psychological, medical or learning disability that may impact on your ability to carry out assigned course work, I would urge that you contact University Disability Services (DS), 115 Johnston Hall (225-578-5919, disability@lsu.edu, http://disability.lsu.edu/). Please bring a letter to me from the DS indicating your need for academic accommodations within the first week of class. The syllabus and other class materials can be made available in alternative format upon request.
### 14-Week Outline:

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
<th>Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Course Overview</td>
<td>Chap. 1</td>
</tr>
<tr>
<td></td>
<td>Bits and Bytes</td>
<td>Chap. 2.1</td>
</tr>
<tr>
<td>2</td>
<td>Integer Representations</td>
<td>Chap. 2.2</td>
</tr>
<tr>
<td>3</td>
<td>Integer Arithmetic</td>
<td>Chap. 2.3</td>
</tr>
<tr>
<td>4</td>
<td>Floating Point</td>
<td>Chap. 2.4</td>
</tr>
<tr>
<td>5</td>
<td>Machine Programs: Basics</td>
<td>Chap. 3.1-3.4</td>
</tr>
<tr>
<td></td>
<td>Machine Programs: Arithmetic</td>
<td>Chap. 3.5</td>
</tr>
<tr>
<td>6</td>
<td>Machine Programs: Control</td>
<td>Chap. 3.6</td>
</tr>
<tr>
<td>7</td>
<td>Machine Programs: Procedures</td>
<td>Chap. 3.7</td>
</tr>
<tr>
<td>8</td>
<td>Review and Midterm</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Machine Programs: Arrays</td>
<td>Chap. 3.8</td>
</tr>
<tr>
<td></td>
<td>Machine Programs: Structures</td>
<td>Chap. 3.9</td>
</tr>
<tr>
<td>10</td>
<td>Storage Technologies</td>
<td>Chap. 6.1</td>
</tr>
<tr>
<td></td>
<td>The Memory Hierarchy</td>
<td>Chap. 6.2-6.4</td>
</tr>
<tr>
<td>11</td>
<td>Cache Memories</td>
<td>Chap. 6.4-6.7</td>
</tr>
<tr>
<td>12</td>
<td>Cache Memories</td>
<td>Chap. 6.4-6.7</td>
</tr>
<tr>
<td></td>
<td>Instruction Set</td>
<td>Chap. 4.1-4.3</td>
</tr>
<tr>
<td>13</td>
<td>Sequential Implementation &amp; Pipelining</td>
<td>Chap. 4.3-4.4</td>
</tr>
<tr>
<td></td>
<td>Pipelined Implementation</td>
<td>Chap. 4.5</td>
</tr>
<tr>
<td>14</td>
<td>Review</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Final Exam</td>
<td></td>
</tr>
</tbody>
</table>
Instructor:
Sam Irving, email: sirvin1@lsu.edu
Roozbeh Karimi, email: rkarim2@lsu.edu

Class Time and Location:
4:30-7:20PM W 109 TUREAUD HALL

Office hours:
Sam Irving: 1:30–4:30PM W 201 EE Building (weeks 1-7)
Roozbeh Karimi: TBA (weeks 8+)

Course Description: Structure and organization of computer systems; instruction sets; arithmetic; data path and control design.

Prerequisites: EE2740 or equivalent.

Text:
Required: Computer Organization and Design, 5th Edition: The Hardware/Software Interface, Author(s): David Patterson & John Hennessy,
  Release Date: 26 Sep 2013
  Imprint: Morgan Kaufmann
  Print Book ISBN: 9780124077263
eBook ISBN :9780124078864

Optional Reference:
Brown & Vranesic, “Fundamentals of Digital Logic with Verilog Design.” (The textbook used in EE 2720, 2730, and 2740.)

Topics:
1. Computer Abstractions and Technology
2. Instructions
3. Arithmetic for Computers
4. Processor
5. Logic Design and Verilog

Policy and Procedures:

Homework.
- Students will submit homework individually in the following format:
  - Begin each problem in a new page.
  - Number the pages as follows: 1 of 5, 2 of 5, … , 5 of 5.
  - The problems should be submitted in the same order as in the assignment.
  - Staple the pages and fold them vertically.
  - Write your name on the outside.
  - In order to encourage you to follow the instructions given above, 2 points will be deducted for each of the instructions which are not followed.
- The student will be given the opportunity to submit late homework until the second class after the homework’s due date. Late homework will be penalized 10% of the original maximum grade for each day it is late.
All homework assignments are due at the end of classes.

Exams.
- All exams will be closed notes.

Quizzes and classroom assignments
- There will be quizzes or group class assignments and they may be in the beginning, middle or end of the class.

Test, homework, quiz, classroom assignment, and laboratory report grading.
- If you believe an error was made in grading your assignment, you should write a short justification of your claim and attach it to the original assignment. Hand it to your instructor or slide it under his office door within one week of it being returned to you.

Make-ups on Exams and Quizzes.
- If you miss an exam or quiz without either a medical excuse or prior instructor approval, you will not be given a make-up.

Grading:
- Homework, Quizzes and Classroom Assignments: 15%
- 1 Midterm Test – Oct. 4th, Wednesday in class: 35%
- Final – M Dec. 4, 5:30 - 7:30 PM: 50%

Grading Scale:
- A+ ≥ 97, A ≥ 93, A- ≥ 90
- B+ ≥ 87, B ≥ 83, B- ≥ 80
- C+ ≥ 77, C ≥ 73, C- ≥ 70
- D+ ≥ 67, D ≥ 63, D- ≥ 60
- F < 60

Plus/Minus Grades Guidance
https://sites01.lsu.edu/wp/registraroffice/academics/plusminus-grades-guidelines/

Curving:
- At the discretion of the instructor a grading curve may be used to allow for a more favorable grade distribution
## CURRENT

**Critical Path 2017-2018**

**Software Engineering**

**CRITICAL REQUIREMENTS**

<table>
<thead>
<tr>
<th>Semester 1: <strong>MATH 1021.</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>SEMESTER 2: &quot;C&quot; or better in ENGL 1001.</td>
</tr>
<tr>
<td>SEMESTER 3: &quot;C&quot; or better in MATH 1550/ MATH 1551.</td>
</tr>
<tr>
<td>SEMESTER 4: &quot;C&quot; or better in CSC 2259.</td>
</tr>
<tr>
<td>SEMESTER 5: MATH 2090.</td>
</tr>
</tbody>
</table>

A grade of "C" or better is required in all CSC prerequisite courses; **CSC 1200, CSC 4101, CSC 4103, and CSC 4330**, MATH 1550 and MATH 1552; **BIOL 1001 or BIOL 1201** and all science prerequisite courses including laboratory courses.  

**Semester 1**

- **CRITICAL:** **MATH 1021.**
- **CSC 1350 Computer Science I for Majors (4)**
- **ENGL 1001 English Composition (3)**
- **MATH 1550 Analytic Geometry and Calculus I (5)**
- General Education course - Natural Sciences (3)

**Total Semester Hours: 15**

## PROPOSED

**Critical Path 2018-2019**

**Software Engineering (SEG)**

**CRITICAL REQUIREMENTS**

<table>
<thead>
<tr>
<th>SEMESTER 1: <strong>MATH 1021.</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>SEMESTER 2: &quot;C&quot; or better in ENGL 1001.</td>
</tr>
<tr>
<td>SEMESTER 3: &quot;C&quot; or better in MATH 1550/ MATH 1551.</td>
</tr>
<tr>
<td>SEMESTER 4: &quot;C&quot; or better in CSC 2259.</td>
</tr>
<tr>
<td>SEMESTER 5: MATH 2090.</td>
</tr>
</tbody>
</table>

A grade of "C" or better is required in all CSC prerequisite courses; **CSC 3200, CSC 4101, CSC 4103, and CSC 4330**, MATH 1550 and MATH 1552; **BIOL 1001 or BIOL 1201** and all science prerequisite courses including laboratory courses.  

**Semester 1**

- **CRITICAL:** **MATH 1021.**
- **CSC 1350 Computer Science I for Majors (4)**
- **ENGL 1001 English Composition (3)**
- **MATH 1550 Analytic Geometry and Calculus I (5)**
- General Education course - Natural Sciences (3)

**Total Semester Hours: 15**
**Semester 2**

- **CRITICAL:** “C” or better in ENGL 1001.

- **CSC 1351 Computer Science II for Majors (4)**
- **MATH 1552 Analytic Geometry and Calculus II (4)**
- General Education course - Natural Sciences (3)
- General Education course - Humanities (English/Honors 2000-level) (3)
- General Education course - Humanities (Communication-Studies course) (3)

**Total Semester Hours: 17**

**Semester 3**

- **CRITICAL:** “C” or better in MATH 1550/ MATH 1551.

- **CSC 2259 Discrete Structures (3)**
- **CSC 3102 Advanced Data Structures and Algorithm Analysis (3)**
- **MATH 2090 Elementary Differential Equations and Linear Algebra (4)**
- General Education course - Natural Sciences (3)
- General Education course - Natural Sciences Lab (1)
- General Education course - Humanities (3)

**Total Semester Hours: 17**

- **CRITICAL:** “C” or better in MATH 1550/ MATH 1551.

- **CSC 2259 Discrete Structures (3)**
- **CSC 3102 Advanced Data Structures and Algorithm Analysis (3)**
- **MATH 2090 Elementary Differential Equations and Linear Algebra (4)**
- General Education course - Natural Sciences (3)
- General Education course - Natural Sciences Lab (1)
- General Education course - Humanities (3)

**Total Semester Hours: 15**
Semester 4

- **CRITICAL:** "C" or better in CSC 2259.
- **CRITICAL:** "C" or better in CSC 2262 Numerical Methods (3)
- **CRITICAL:** CSC 3380 Object Oriented Design (3)
- **CRITICAL:** CSC 3501 Computer Organization and Design (3)
- **CRITICAL:** ENGL 2000 English Composition (3)
- **CRITICAL:** General Education course - Natural Sciences (3)
- **CRITICAL:** General Education course - Natural Sciences Lab (1)

**Total Semester Hours: 16**

Semester 5

- **CRITICAL:** MATH 2090.
- **CRITICAL:** CSC 3200 Ethics in Computing (1)
- **CRITICAL:** CSC 4101 Programming Languages (3)
- **CRITICAL:** CSC 4330 Software Systems Development (3)
- **CRITICAL:** IE 3302 Engineering Statistics (3)
- **CRITICAL:** Approved Technical Elective (3)

**Total Semester Hours: 13**

Semester 6

- **CRITICAL:** CSC 4103 Operating Systems (3)
- **CRITICAL:** CSC 4351 Compiler Construction (3)
- **CRITICAL:** CSC 2000-level or above (3)
- **CRITICAL:** General Education course - Social Sciences (3)
- **CRITICAL:** Approved Technical Elective (3)

**Total Semester Hours: 15**
Semester 7

- **CSC 4402 Database Systems (3)**
- CSC (2000-level or above) Elective (3)
- Approved Area Elective (3)²
- Approved Elective (3)
- General Education course - Social Sciences (2000-level) (3)

Total Semester Hours: 15

Semester 8

- CSC (3000-level or above) Elective (3)³
- Approved Area Electives (6)²
- General Education course - Arts (3)

Total Semester Hours: 12

120 Total Sem. Hrs.

Semester 7

- **CSC 4402 Database Systems (3)**
- CSC SEG (2000-level or above) Elective (3)
- Approved SEG Area Elective (3)²
- Approved Elective (3)
- General Education course - Social Sciences (2000-level) (3)

Total Semester Hours: 15

Semester 8

- CSC (3000-level or above) Elective (3)³
- CSC SEG (4000-level or above) Elective (3)
- Approved SEG Area Electives (3)²
- General Education course - Arts (3)
- Approved Elective (3)

Total Semester Hours: 15

120 Total Sem. Hrs.
Computer science students are cautioned to verify course descriptions in the catalog noting where duplication of course credits may be prohibited. Additionally, computer science students will not receive degree credit for the following courses: CSC 1240; ELRC 4006; EXST 2201; ISDS 2000, ISDS 2001, ISDS 2010, ISDS 2011, ISDS 3070, ISDS 3075; PSYC 4111; and SOCL 2201.

1 - For General Education Natural Science, two six-hour sequences in both physical and life sciences must be taken; one sequence must include two additional hours of lab work. One sequence must be from the Biological Sciences (BIOL) and the physical science sequence selected from Astronomy, Chemistry, Geology and Physics.

2 - APPROVED AREA ELECTIVES (9 hours required): CSC 4243, CSC 4263, CSC 4356, CSC 4357, CSC 4370, CSC 4444, CSC 4501, CSC 4585, CSC 4610, CSC 4740, CSC 4890; EE 4859, IE 4461; ISDS (max. of 6 hours) from ISDS 4111, ISDS 4112, ISDS 4113, ISDS 4120, ISDS 4125, ISDS 4141; other electives subject to approval.

3 - The selection of the CSC (3000-level or above) elective is not restrictive to topics related to software engineering.

Computer science students are cautioned to verify course descriptions in the catalog noting where duplication of course credits may be prohibited. Additionally, computer science students will not receive degree credit for the following courses: CSC 1240; ELRC 4006; EXST 2201; ISDS 2000, ISDS 2001, ISDS 2010, ISDS 2011, ISDS 3070, ISDS 3075; PSYC 4111; and SOCL 2201.

1 - For General Education Natural Science, BIOL 1001 or BIOL 1201

(3 cr. hrs.) [Physical Science]
Select from PHYS 1201 or PHYS 2001, or CHEM 1001 or CHEM 1201 or CHEM 1421 or ASTR 1101 or GEOL1001 or GEOL 1003

(3 cr. hrs.) A second course science must be selected to complete the sequence in either the BIOL science or physical science.

(2 cr. hrs.) Science lab credits must be wholly associated with the science sequence selected.

2 - APPROVED SEG AREA ELECTIVES (6 hours required): CSC 4243, CSC 4263, CSC 4356, CSC 4357, CSC 4370, CSC 4444, CSC 4501, CSC 4585, CSC 4610, CSC 4740, CSC 4890; EE 4859, IE 4461; ISDS 4111, ISDS 4112, ISDS 4113, ISDS 4120, ISDS 4125, ISDS 4141; other electives subject to approval.

3 - The selection of the CSC 2000-level or above elective (3 cr. hrs.) and 3000-level or above elective (3 cr. hrs.) is not restrictive to topics related to software engineering.
- APPROVED TECHNICAL ELECTIVES: Three hours of elective credits must be selected from **Group A** and three hours of elective credits selected from Group A or Group B.

**GROUP A:** 2000-level and above only chosen from CSC, BE, CHE, CE, CM, EE, ENGR, EVES, IE, ME, PETE, EMS, ENV, OCS, MATH, ECON, FIN, ASTR, BIOL, CHEM, GEOG, GEOL, PHYS, ISDS 3100, ISDS 3105, ISDS 3120.

**GROUP B:** ART 2050, ART 2055, ART 2551, ART 4050, ART 4055, ART 4550, ART 4059, ART 4560, ARTH 4466, ARTH 4468, ARTH 4480, ARTH 4482, ARTH 4484, MC 4015, MC 4260, MUS 2745, MUS 4745, MUS 4746, ENGL 2009, ENGL 2231, ENGL 4000, ENGL 4009, ENGL 7109.

---

5 - Students who have completed the prerequisites may substitute **MATH 3355** or **EE 3150** or **EXST 4050** for **IE 3302**.

---

5 - Credit will not be applied to the degree for courses with overlapping content. For clarification, contact the division's academic adviser. Students who have completed the prerequisites may substitute:

- **EE 4740** for CSC 2259 but not both
- **EE 3755** for CSC 3501 but not both
- MATH 3355 or **EE 3150** or EXST 4050 for **IE 3302**.
Date: Wed, 25 Oct 2017 17:02:24 +0000  
From: John D Scalzo <jscalz1@lsu.edu>  
To: Coretta Douglas <douglas@csc.lsu.edu>  
Subject: RE: Response Requested - Curriculum Change RE: CSC 3501 & EE 3755

ECE approves of this substantiation.

John Scalzo, MSEE  
Senior Instructor, Undergraduate Adviser  
Division of Electrical and Computer Engineering  
Louisiana State University  
102 South Campus Drive 150-E, Baton Rouge, LA 70803  
office 225-578-5478  
www.ece.lsu.edu/fac/Scalzo.html

-----Original Message-----
From: Coretta Douglas [mailto:douglas@csc.lsu.edu]
Sent: Wednesday, October 18, 2017 12:54 PM
To: John D Scalzo <jscalz1@lsu.edu>
Cc: Busch, Konstantin <busch@csc.lsu.edu>; Jerry L Trahan <jtrahan@lsu.edu>
Subject: CSE: Response Requested - Curriculum Change RE: CSC 3501 & EE 3755

Dear John,

CSE is proposing curriculum changes that involve credit in EE 3755 applied toward the (1) computer science major and the (2) computer science minor. A timely response from the Division of Electrical and Computer Engineering is needed.

Please respond with either favorable reply (approved) or with substantiation if you object to the 2 changes.

(1) We have been informed by ABET (abet.org) that the computer science curriculum is not restricted to a minimum of 40 credit hours of CSC coursework. ABET instead requires at least 40 cr. hrs. of computer science "subject content"; we have the flexibility to substitute other department's coursework that covers the content of the CSC equivalent.

Currently, for CS majors with earned credit in EE 3755, we require a computer science (CSC) course CSC 3000-level and above to substitute for CSC 3501. The requirement was needed to ensure that CS majors, particularly in the 2nd Discipline concentration, had the minimum of 40 cr. hrs. of CSC coursework.

With approval of the proposed change, the degree audits (all concentrations) will be programmed to permit credit in either CSC 3501 or EE 3755. The LSU General Catalog states that students may not receive credit for both CSC 3501 and EE 3755.

(2) CSC 3501 is required for the minor in computer science. After manual review, by the CSE academic adviser, a counselor in the College of Engineering is informed of the approved substitution EE 3755 for CSC 3501 in the declared computer science minor. The Counselor then must manually make the change to the student's degree audit. We
are making the substitution explicit in the LSU General Catalog description for the computer science minor.

See attached documents.

Regards,
Coretta

Coretta Douglas, Ph.D. Computer Science
Undergraduate/Instructional Coordinator and Instructor
Patrick F. Taylor 3270-A
** Division of Computer Science and Engineering **
School of Electrical Engineering and Computer Science

4 7/91
REQUEST FOR ADDING, CHANGING, SUSPENDING OR DROPPING UNDERGRADUATE MINOR

Department: Div. Computer Sci & Eng  
College: Engineering  
Name of Minor: Computer Science  
Date: 10-11-17

Has this change been discussed with and approved by all departments/colleges affected?  Yes ( )  No ( )  N/A ( )

ATTACH JUSTIFICATION for all actions: Use separate sheet.

ATTACH RESPONSE from any departments affected (i.e. any department whose course(s) are to be added).

**ACTION** (check appropriate box):

( ) ADDING: Show the entire new minor using catalog format. Use plain sheets and attach.

( ) CHANGING: List present catalog description which is to be changed (left column) and the changes proposed (right column). In proposed column use strikeout and bold to indicate deletions and additions. Explain all changes adequately on attachment.

( ) SUSPENDING: Provide an adequate explanation for suspending the minor on plain sheets and attach.

( ) DROPPING: Provide an adequate explanation for dropping the minor on plain sheets and attach.

### MINOR

**PRESENT**  

<table>
<thead>
<tr>
<th>Total semester hours in current minor:</th>
<th>21 cr. hrs.</th>
</tr>
</thead>
</table>

**Computer Science Minor**

An undergraduate *minor in computer science* is available. Required courses are `CSC 1253, CSC 1254, CSC 2259, CSC 3102, CSC 3501`, and three hours of computer science electives at the 3000 level and above; and `CSC 4101` or `CSC 4103` (total of 21 hours).

**PROPOSED**  

<table>
<thead>
<tr>
<th>Total semester hours in proposed minor:</th>
<th>21 cr. hrs.</th>
</tr>
</thead>
</table>

**Computer Science Minor**

An undergraduate *minor in computer science* is available. Required courses are a two-course 6 credit hour introductory programming sequence, `CSC 1253` and `CSC 1254` or `CSC 1350` and `1351`, `CSC 2259` or `EE 4740, CSC 3102, CSC 3501` or `EE 3755`, and three hours of computer science electives at the 3000 level and above; and `CSC 4101` or `CSC 4103` (total of 21 hours).

**APPROVALS:**

Department Faculty Approval Date  
9-29-17  
(Department Chair's Signature)  
10/18/2017

College Faculty Approval Date  
11/11/17  
(Department Chair's Signature)  
11/18/17

College Dean's Signature  
11/11/17  
(Academic Affairs Approval)  
11/18/17

Contact Email
(Please print name.)
JUSTIFICATION:
(1) CSC 2259 Discrete Structures is a required course for all Computer Science (CS) majors and for the CS minor.
   a. See accompanying course change form C for CSC 2259. We are proposing to add the statement, 
      "Credit will not be given for both this course and MATH 2020 or EE 4740."
   b. Furthermore, we are requesting that the 2018-2019 CS B.S. degree audit (all concentrations) and the 
      CS minor be programmed to accept credit from either of the comparable courses: CSC 2259 or EE 
      4740. We are helping students who pursue dual majors, the CS minor or those students who charge 
      majors to CS to leverage overlapping credits.

The Mathematics Department has declined to accept CS majors in MATH 2020 classes as an alternative 
due to restricted faculty resources. We will continue to work individually with students who have earned 
credit in MATH 2020 [such as MATH majors] and are pursuing either a CS dual major or the CS minor 
for accommodations on an exception basis.

(2) CSC 3501 Computer Organization and Design is a required course for all CS majors and for the CS minor. 
The LSU Catalog prohibits credit in both CSC 3501 and EE 3755. We are requesting that the 2018-2019 CS 
B.S. degree audit and the CS minor be programmed to accept credit from either of the comparable courses: 
CSC 3501 or EE 3755. We are helping students who pursue dual majors, the CS minor or those students 
who change majors to CS to leverage overlapping credits.

(3) The CSE division supports two introductory programming sequences: CSC 1253 and 1254; CSC 1350 and 
1351. The sequences cover the identical essential content but utilize different programming languages, C++ 
and Java, respectively. Currently the courses are substituted for each other following a manual request by 
the Computer Science & Engineering (CSE) division's undergraduate academic advisor. By explicitly stating 
in the catalog and therefore the degree audits for the CS minor, the exceptions are clearly communicated; 
the process of tracking the minor requirements by college counselors will be simplified.

CSC 1350 and 1351 are required for the computer science majors and are 4 cr. hrs. each (3 hour lecture 
and 3 hour computer lab). With availability of increased computer lab space in Patrick F. Taylor, the 
additional enrollment of students selecting the CSC 1350-1351 sequence will be accommodated. Additional 
credit hours (2 cr. hrs.) obtained by taking CSC 1350 and 1351 will not be applied to the minor.

CSC 1253 is required in the Electrical Engineering curriculum. CSC 1253 and 1254 are required in the 
Computer Engineering curriculum. Students in those majors use overlapping curriculum requirements to 
obtain the CS minor and will continue to enroll in the required C++ sequence.
<table>
<thead>
<tr>
<th>CURRENT CS MINOR REQUIREMENTS</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CSC 1253 Computer Science I with C++ (3)</strong></td>
<td><strong>CSC 1350 Computer Science I for Majors (4)</strong></td>
<td><strong>CSC 1351 Computer Science II for Majors (4)</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Prereq.: credit or registration in MATH 1450 or credit in MATH 1431. Credit will not be given for both this course and CSC 1250 or CSC 1350. Fundamentals of algorithm development, program design and structured programming using an object-oriented language.</strong></td>
<td><strong>Prereq.: credit or registration in MATH 1022 or MATH 1023 or MATH 1550 or MATH 1551 or MATH 1552. Credit will not be given for both this course and CSC 1250 or CSC 1253. 3 hrs. lecture; 3 hrs. lab. Fundamentals of algorithm development, program design and structured programming using an object-oriented language.</strong></td>
<td><strong>Prereq.: CSC 1350; credit or registration in MATH 1550. Credit will not be given for both this course and CSC 1254. 3 hrs. lecture; 3 hrs. lab. Develops solutions to problems using an object-oriented approach and emphasizes the concepts of recursion; dynamic memory; data structures (lists, stacks, queues, trees); exception handling.</strong></td>
<td></td>
</tr>
<tr>
<td><strong>CSC 1254 Computer Science II with C++ (3)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
CSC 1253 – Spring 2017
Computer Science I with C++

Instructor: Dr. Coretta Douglas, Office: 3270-A PFT
Monday: 1:00 – 3:00 CSC 1253 students only
Tuesday: 3:00 – 4:00 CSC 1253 students only
Email (preferred contact): douglas@csc.lsu.edu (Include “CSC 1253” in the subject line)
DO NOT leave voice messages!
Prerequisites: Credit or registration in MATH 1550 or credit in MATH 1431

Reference: Starting Out with C++ From Control Structures through Objects, Tony Gaddis.
Pearson/Addison Wesley

Grading:

<table>
<thead>
<tr>
<th>POINT SYSTEM</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Mid-term</td>
<td>100 pts</td>
<td>&gt;= 98%  A+</td>
</tr>
<tr>
<td>Final Exam</td>
<td>100 pts</td>
<td>&gt;= 93 and &lt; 98%  A</td>
</tr>
<tr>
<td>Assignments (6 @20 pts)</td>
<td>120 pts</td>
<td>&gt;= 90 and &lt; 93%  A-</td>
</tr>
<tr>
<td>Class Participation Exercises</td>
<td>40 (-11% grade)</td>
<td>&gt;= 87 and &lt; 90%  B+</td>
</tr>
<tr>
<td></td>
<td>360 total</td>
<td>&gt;= 83 and &lt; 87%  B</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&gt;= 80 and &lt; 83%  B-</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Assignment Dates</th>
<th>Handout</th>
<th>Due</th>
</tr>
</thead>
<tbody>
<tr>
<td>August 24th</td>
<td>A#1 – Out</td>
<td>A#1 – Due</td>
</tr>
<tr>
<td>August 31st</td>
<td>A#2 – Out</td>
<td>A#2 – Due</td>
</tr>
<tr>
<td>September 7th</td>
<td>A#3 – Out</td>
<td>A#3 – Due</td>
</tr>
<tr>
<td>September 21st</td>
<td>A#4 – Out</td>
<td>A#4 – Due</td>
</tr>
<tr>
<td>October 5th</td>
<td>A#5 – Out</td>
<td>A#5 – Due</td>
</tr>
<tr>
<td>October 24th</td>
<td>A#6 – Out</td>
<td>A#6 – Due</td>
</tr>
<tr>
<td>November 7th</td>
<td>Final Exam</td>
<td>Classroom</td>
</tr>
<tr>
<td>November 28th</td>
<td>Final Exam</td>
<td>Classroom</td>
</tr>
</tbody>
</table>

Test Dates
- October 10th: Midterm
- December 6th: Final Exam

Class Policy: (Exceptional cases handled on an individual basis)
- **Student Class Participation:**
The class meets for a total of 3 hours per week which constitutes a 3 hour credit course. While notes and reference materials may be posted via Moodle, the class is not designed as online-based; students are expected to attend class. Absences should be rare and exceptional. Students are expected to have read the assigned chapters or pages prior to class for the background necessary to properly participate in the discussion and think critically about the concepts addressed. As a general policy, for each hour you are in class, you (the student) should plan to spend at least two hours preparing for the next class. Since this course is for three credit hours, you should expect to spend around six hours outside of class each week in activities such as reading, writing homework assignments, and/or completing programming-based exercises for the class.

- **Academic Integrity:** The LSU Honor Code [http://saa.lsu.edu/code](http://saa.lsu.edu/code) governs all work in this course. Unless indicated otherwise, all submissions must be done only by the individual whose name appears on the submission.

- **Disability Services:** LSU remains strongly committed to providing appropriate accommodations for students with disabilities. The LSU office of Disability Services works to provide individualized services to ensure that all students have equal access to learn and live at LSU.
• CSC 1253 (S2) will require an estimated 9 hours of study preparation and assignment work outside of class per week.
• Class periods will often utilize a "flipped classroom" instructional strategy. Student reading and study is expected to precede the class lecture. Class participation exercises are used for developmental learning and may require use of concepts not covered during the lecture but announced as preparation subject content. See next page.
• Attendance in class has been shown to be an indicator of success in the class.
• Class exercises are expected to be completed in 15-20 minutes; approximately 10-12 total number of exercises will consist of, for example, short answer, syntax related questions, and small programming challenges. A maximum of two students are permitted per team effort. Open notes, open text, or any online materials are acceptable resources.
• Do not post notes online or in public arena.

• Student is responsible for checking email FREQUENTLY.
• NO make-up tests; early tests given with valid excuse.
• NO access to calculators, phones, ipods, etc. during the tests/exams.
• ALL problems concerning grades MUST be resolved within 3 class days following the return of graded work.
• Programming Assignments:
  - Assignments are electronically submitted to our CSC1253 "classes" grading account
    Assignments must compile using g++ on the classes machine.
  - NO teamwork. All work is by the individual student.
  - Late assignments accepted with 5-point deduction; due next day 8:00AM.
  - Correct results (output) are not the only criteria for good grades.
    Assignments must meet the assignment objectives, programming and documentation standards.
  - DO NOT use programming syntax or features not yet introduced in the class.
  - Severe points deducted for compile time errors or run-time errors, use of global variables, use of break or continue in a repetition.
  - Hardware problems are not acceptable excuses for late programs. LSU network is recommended.
    Solutions are not supplied.
• Grading scale may be adjusted if student demonstrates remarkable improvement on the final.
• Contact William Duncan (duncan@csc.lsu.edu) if you have a complaint and would like to remain anonymous.

Good Advice:
  Attend class; ask questions, read the text before class, read over notes after class,
  Begin assignments immediately; write programs out by hand before typing into the computer,
  Get the phone number of a classmate - Student has the responsibility of getting assignments,
  missed notes, date changes, etc.

  LSU Career Expo – September 6-7. Get an internship in your field of study!
### Tentative Lecture/Study Guide:

<table>
<thead>
<tr>
<th>Lecture</th>
<th>Notes</th>
</tr>
</thead>
</table>
| Chapter 1 Introduction to Computers and Programming | Hardware and Software  
Types of Hardware & Software |
| Chapter 2 Introduction to C++ | Begin Syntax: variable declarations, I/O, |
| Chapter 3 | Expressions arithmetic expressions, precedence and associativity |
| Continue Chapter 3 (skip files for now) | |
| Chapter 4 relational operators | Selection structure |
| Chapter 5 Loops (wait a while on files) | Counter-control (while & do-while)  
Defined constants |
| Review counter control | Sentinel control  
Finding largest and smallest  
Nested repetition |
| The Software Development Method (class notes) | What is an Algorithm? Sequence & Selection & Repetition  
C++ History (optional) |
| Use of ‘for’ construct for repetition | Using an accumulator to find average  
Library functions  
Switch for double selection  
Compound conditionals |
| Chapter 6 Function Basics | Predefined functions,  
Scope and duration,  
Modular design (Structure Charts),  
Actual parameters and formal parameters,  
(skip recursion)  
pass by reference  
Enumerated Data Types |
| Chapter 7 Text Files | Formatting Input/output,  
Istream and ofstream objects,  
File objects and parameters |
| Chapter 7 Arrays | Parallel arrays |
| Binary Search | |
| Linear search | (unordered & ordered) |
| Frequency arrays | Questions/discussion  
More on manipulators |
| Chapter 10 String class | |
| Selection sort (Chapter 8) | Array of indexes |
| Chapter 11 Structures /Classes | |
| Chapter 11 Structured Data | Nested Structures / Classes  
Structures as function arguments |
| Address pointers | Call by address using pointers  
Runtime stacks (class notes)  
Pointers to pointers |
| Chapter 13 Introduction to Classes | Classes encapsulation, inheritance, polymorphism,  
constructors, overloading, |
CSc 1254 Fall 2014  
Computer Science II with C++  

Instructor: Dr. Coretta Douglas  
Office: PFTaylor #3118 – Computer Science and Engineering (CSE) NE  
Office hours:  
Monday: 1:00 – 3:00  
CSC 1254 students only  
Tuesday: 3:00 – 4:00  
Wednesday: 9:00 – 11:00  
Thursday: 3:00 – 4:00  
Friday: Curriculum advising by appointment  
Email (preferred contact): douglas@cs.lsu.edu (email received must be identifiable by name or subject)  

Catalog Description:  
Prereq: CSC 1253; credit or registration in MATH 1550. Credit will not be given for both this course and CSC 1351. Develops solutions to problems using an object-oriented approach and emphasizes the concepts of recursion; dynamic memory; data structures (lists, stacks, queues, trees); exception handling.  

Reference: Starting Out with C++ From Control Structures through Objects, Tony Gaddis, Pearson/Addison Wesley.  
Notes: 3-Ring Binder (hole-punch) Recommended  

Grading:  
<table>
<thead>
<tr>
<th>Point System</th>
<th>Grading Scale</th>
</tr>
</thead>
</table>
| Self-Test for Review | 10 pts | >= 98% A+  
| Test 1 | 100 pts | >= 93 and < 98 A  
| Test 2 | 100 pts | >= 90 and < 93 A-  
| Final Exam | 100 pts | >= 87 and < 90 B+  
| Programming Assignments (6 total # 10 pts each) | 120 pts | >= 83 and < 87 B  
| Class Participation | 50 (-10% grade) | >= 80 and < 83 B-  
| 480 total | | >= 77 and < 80 C+  
|  | | >= 73 and < 77 C-  
|  | | >= 67 and < 70 D+  
|  | | >= 63 and < 67 D  
|  | | >= 60 and < 63 D-  
|  | | < 60 F  

Exams:  
Test 1-A – IN CLASSROOM, (Thursday, September 25) tentative  
Test 1-B – IN Classroom, (Thursday, October 16) tentative  
Test 2 – IN CLASSROOM, (Thursday, October 30) tentative  
Final – IN CLASSROOM, (Tuesday, December 9, 5:30 – 7:30 PM) tentative  

Class Policy: (Exceptional cases handled on an individual basis)  
- Student Class Participation:  
The class meets for a total of 3 hours per week which constitutes a 3 hour credit course. While notes and reference materials may be posted via Moodle, the class is not designed as online-based; students are expected to attend class. Absences should be rare and exceptional. Students are expected to have read the assigned chapters or pages prior to class for the background necessary to properly participate in the discussion and think critically about the concepts addressed. As a general policy, for each hour you are in class, you (the student) should plan to spend at least two hours preparing for the next class. Since this course is for three credit hours, you should expect to spend around six hours outside of class each week in activities such as reading, writing homework assignments, and/or completing programming-based exercises for the class.  
- Academic Integrity: The LSU Honor Code http://saa.lsu.edu/code governs all work in this course. Unless indicated otherwise, all submissions must be done only by the individual whose name appears on the submission.  
- Disability Services: LSU remains strongly committed to providing appropriate accommodations for students with disabilities. The LSU office of Disability Services works to provide individualized services to ensure that all students have equal access to learn and live at LSU.
• Student is responsible for checking email **FREQUENTLY**.
• Early tests given with valid excuse; late test make-up upon rare exception.
• **NO** access to calculators, phones, ipods, computers etc. during the tests/exams.
• ALL problems concerning grades **MUST** be resolved within 3 class days following the return of graded work.

• Programming Assignments:
  - Assignments are electronically submitted to our **CSC1254_dou “classes”** account into the assignment grader’s subdirectory. Assignments must compile using g++ on the classes’ machine.
  - Correct results (output) are not the only criteria for good grades.
  - Assignments must meet the assignment objectives, programming and documentation standards and professional communication standards.
  - **DO NOT** use programming syntax or features not yet introduced in the class.
  - **Severe points deducted** for compile time errors or run-time errors, use of global variables, use of break or continue in a repetition.
  - Hardware problems are not acceptable excuses for late programs. LSU network is recommended.
  - **Solutions are not supplied**.
  - Assignments 5 & 6 **ONLY** are team assignments (2 students max per team)
  - Class participation consists of **open notes** pop tests, small class group projects, etc. 3-5 points each.

• Contact Dr. William Duncan (duncan@csc.lsu.edu) if you have a complaint and would like to remain anonymous.

**Good Advice:**

Attend class; ask questions, read the text before class, read over notes after class,

Begin assignments **immediately**; write programs out by hand before typing into the computer,

Get the phone number of a classmate -
   Student has the responsibility of getting assignments, missed notes, date changes, etc.

**More Good Advice:** Get an internship in your field of study!
<table>
<thead>
<tr>
<th>Class Date</th>
<th>Lecture</th>
<th>Assignment Handout</th>
<th>Due</th>
<th>TEST</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aug 26 wk 1</td>
<td>Notes: Review C++</td>
<td>A1 (Thursday) (Using UNIX, review C++ structures, sort)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sept 1</td>
<td>LABOR DAY HOLIDAY</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sept 2 wk 2</td>
<td>(2nd and 4th) Complete Review</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sept 9 wk 3</td>
<td>(9th) Begin ADT lists: Insertion and deletion Notes: OOP; Notes: Copy constructors Complete ADT array list</td>
<td>A2 (Thursday) (Classes, constructor, dynamic memory, array-based implementation - List)</td>
<td>A1 Sept 11 Thursday</td>
<td>Self-Test Tues Sept 9th</td>
</tr>
<tr>
<td>Sept 16 wk 4</td>
<td>(16th) ADT List: operations (18th) Review pointers and run-time stacks Notes: More About Classes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sept 30th wk 6</td>
<td>(30th) ADT operations (linked list), traversal</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oct 2,3</td>
<td>FALL HOLIDAY</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oct 7 wk 7</td>
<td>(7th) Complete linked lists operations (9th) Begin Stacks</td>
<td>A3 (Tuesday) (linked list implementation - List)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oct 14, wk 8</td>
<td>(14th) ADT Stack - Linked list (16th) Complete stack</td>
<td>A4 (Thursday) (linked list stack, separate compilation, depth first search)</td>
<td>A3 Oct 16 Thursday</td>
<td>Test 1-B Thursday Oct 16th</td>
</tr>
<tr>
<td>Oct 21 wk 9</td>
<td>(21st) Introduction to Recursion (23rd) continue recursion Handout code on Merge Sort</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oct 28 wk 10</td>
<td>(28th) Review Test 2 [Linked list ADT; stacks, recursion] (28th) Begin ADT Queue Circular array-based</td>
<td>A4 Oct 30th Thursday</td>
<td>Test 2 Oct 30th</td>
<td></td>
</tr>
<tr>
<td>Nov 4th wk 11</td>
<td>(4th) Continue ADT Queue (6th) Complete ADT Queue Makefiles Return Test 2 Trees - linked list</td>
<td>A5 (Tuesday) (Queue array-based; Makefiles)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nov 11 wk 12</td>
<td>(11th, 13th, 18th) ADT BST (recursive linked list); operations; Traversals (Depth First Search, Breadth First search)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nov 18 wk 13</td>
<td>(18th) Complete ADT- BST (20th) exceptions</td>
<td>A6 (Tuesday) (ADT BST; Traversal; depth first search)</td>
<td>A5 Nov 18th Tuesday</td>
<td></td>
</tr>
<tr>
<td>Nov 25 wk 14</td>
<td>Quick Sort</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nov 26NOON-29</td>
<td>THANKSGIVING HOLIDAY</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dec 2, wk 15</td>
<td>(2nd) Algorithmic Robust verification of input data Doubly linked lists, circularly linked lists</td>
<td></td>
<td>A6</td>
<td></td>
</tr>
<tr>
<td>Dec. 9th</td>
<td>IN CLASSROOM 5:30 – 7:30 PM</td>
<td></td>
<td></td>
<td>FINAL EXAM</td>
</tr>
</tbody>
</table>
CSC 1350: Introduction to Computer Science I for Majors

Sections 1-3: MWF 09:30 - 10:20 AM
class webpage: http://www.csc.lsu.edu/~duncan/courses/csc1350-f17

Instructor: William E. Duncan, Ph.D.
Office: 3270C Patrick F. Taylor Hall
Email Address: duncan@csc.lsu.edu
Office Hours: http://www.csc.lsu.edu/~duncan/sched.htm

Course Description:

Fundamentals of programming, program design, and algorithms using a high-level block-structured language. - 4 sem. hrs.

Required Textbook:

Big Java Late Objects Includes Java 8 Coverage 2/e, Cay Horstmann

Prerequisites:

1. Credit or registration in MATH 1550 or Dual-Enrollment Eligibility.

2. Credit will not be given for both this course and CSC 1248 or 1250 or 1251 or 1253 or 2290 or 2390.

Duncan 1 Fall 2017
Goal:

To build problem-solving skills from an algorithmic viewpoint using the Java programming language. By the end of this course the student will:

- understand the origins and early development of computer science as an academic discipline as well as the basic issues underpinning the discipline,
- employ programming principles in problem-solving,
- Design and analyze basic searching and sorting algorithms, and
- explore the fundamentals of the object-oriented programming (OOP) paradigm.

Evaluation:

Grading will be based on laboratory exercises, programming projects and three exams.

Exam 1
Exam 2
Final Exam
Laboratory Exercises
Programming Projects

20%
20%
20%
15%
25%

Final grade will be determined by overall average as follows:

Table 1: Percentage Score to Letter Grade Assignment

<table>
<thead>
<tr>
<th>SCORE</th>
<th>GRADE</th>
<th>SCORE</th>
<th>GRADE</th>
<th>SCORE</th>
<th>GRADE</th>
</tr>
</thead>
<tbody>
<tr>
<td>90-92.99</td>
<td>A-</td>
<td>93-96.99</td>
<td>A</td>
<td>97-100</td>
<td>A+</td>
</tr>
<tr>
<td>80-82.99</td>
<td>B-</td>
<td>83-86.99</td>
<td>B</td>
<td>87-89.99</td>
<td>B+</td>
</tr>
<tr>
<td>70-72.99</td>
<td>C-</td>
<td>73-76.99</td>
<td>C</td>
<td>77-79.99</td>
<td>C+</td>
</tr>
<tr>
<td>0-59.99</td>
<td>F</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Class Policies:

- **Attendance**: There will be no make-up for missed work. A grade of 0 is awarded for missed work in the absence of a valid excuse. It is your responsibility to obtain notes and assignments from a willing classmate if you MUST miss class.

- **Collaborative Work**: High standards of academic integrity are crucial for the University to fulfill its educational mission. To uphold these standards, procedures have been established to address academic misconduct. [From LSU Code of Student Conduct](http://students.lsu.edu/saa/code_10_1). It is assumed that all students enrolled in this course have read the Code of Student Conduct - specifically section 5.1 (Academic Misconduct) and section 8.5 (Academic Misconduct by Undergraduate Students) or section 8.6 (Academic Misconduct by Graduate Students). The Code of conduct is available at:

  http://students.lsu.edu/saa/code_10_1

- **Due Dates**: All work intended for grading at full credit must be submitted on time. Programming exercises will be submitted via drop boxes on the course Moodle. The cut-off period for late submission of laboratory exercises is an hour past the due time with a late penalty of 25%. The cut-off period for late submission of programming projects is one day with a late penalty of 10% if the work is not more than an hour late and 25% if it is more than an hour late. Any work submitted after the cut-off period is not graded.

- **Grading Corrections**: All grades are uploaded to the course Moodle. Concerns about grades must be addressed within a week after the graded work is returned. Thereafter, all grade book entries are final.

- **Missed Exam**: Students are encouraged to take every exam. In the unusual circumstance you miss an exam due to medical reasons or other unforeseen emergencies, obtain an official excuse from the Dean's office as soon as possible. If you obtain a valid excuse from the Dean's office, the instructor reserves the right to schedule a cumulative final exam that will count for the exam missed and the final exam.
• **Special Accommodation:** Students who have a disability that require accommodation(s) should make an appointment with the Office of Disability Services (Phone: (225)578-5919 or TDD: (225)578-2000) to discuss their specific needs and present a letter from the ODS informing the instructor of their needs. All such matters, by University regulations, are strictly confidential.

• **Exam Dates:**
  1. Exam 1 - Wednesday, September 27
  2. Exam 2 - Wednesday, October 18
  3. Final Exam - Wednesday, December 6, 03:00 - 05:00 P.M.

• **Important Dates:**
  1. Tuesday, August 29 - Final day to drop without a W (4:30 p.m. deadline)
  2. Friday, November 3 - Final day for dropping courses (4:30 p.m. deadline)

• **Topics we will study:** (not necessarily in this order:)
  1. Introduction
  2. Fundamental Data Types
  3. Decisions
  4. Loops
  5. Methods
  6. Arrays (& optional topic - Array Lists)
  7. Text File Input/Output
  8. Objects and Classes
  9. Sorting and Searching
# Problem Sets

<table>
<thead>
<tr>
<th>Topic</th>
<th>Reading</th>
<th>Exercises</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>§1.1-1.6</td>
<td>SC: 4-11, 17-20; R: 1.7; P: 1.1-1.3</td>
</tr>
<tr>
<td>Fundamental Data Types</td>
<td>§2.1-2.3.2.5</td>
<td>SC: 1-3, 10-20, 26-30; R: 2.4-2.8</td>
</tr>
<tr>
<td>Decisions</td>
<td>§3.1-3.4.3.7</td>
<td>SC: 2-19, 31-35; R: 3.1-3.4.3.7</td>
</tr>
<tr>
<td>Loops</td>
<td>§4.1-4.5.4.7-4.8</td>
<td>SC: 5-9, 11-14, 16-20, 25, 31-35, 40-41</td>
</tr>
<tr>
<td>Methods</td>
<td>§5.2</td>
<td>SC: 5-9</td>
</tr>
<tr>
<td>Array &amp; Array Lists</td>
<td>§6.1-6.3.6.8</td>
<td>SC: 1-6, 12-14, 35-36, 39-43</td>
</tr>
<tr>
<td>Text File Input/Output</td>
<td>§7.1-7.2</td>
<td>SC: 1-8</td>
</tr>
<tr>
<td>Objects &amp; Classes</td>
<td>§8.1-8.7, 8.9-8.11</td>
<td>SC: 1.5-6, 12-14, 21-27, 35-38, 40-41</td>
</tr>
<tr>
<td>Sorting and Searching</td>
<td>§14.1,14.3,14.6,14.8</td>
<td>SC: 1-4</td>
</tr>
</tbody>
</table>
Weekly Lecture Schedule CSC 1350

Week 1: (Chapter 1 - Big Java)
A. Administrivia, overview of the course and syllabus
B. Anatomy of the computer / Computer Literacy
C. Using the + operator for addition vs concatenation
D. Using the Netbeans IDE

Week 2: (Chapter 1, 2)
A. Giving pseudocode descriptions of basic algorithms
B. Variables, Arithmetic Operations & Order of Operations

Week 3: (Chapter 2)
B. Writing interactive programs using Scanner Objects
C. Formatted Output (printl - format codes

Week 4: (Chapter 3)
A. Relational Operators & Simple 'if' statement
B. 'if' statements with two alternatives
C. 'if' statements with multiple alternatives.

Week 5: (Chapter 4)
A. Unary Increment and Decrement Operators
B. 'for' loop
C. 'while' loop
D. 'do' Loop

Week 6: (Chapter 4, 6)
A. Nested Loop
B. 1-D Arrays
C. Common Array Algorithms: minimum, maximum, sum, average, finding first match, counting matches, etc.

Week 7: (Chapter 5, 7)
A. Modular Programming: Writing Static Methods
B. Text File Input/Output

Week 8: (Chapter 8)
Object-oriented Programming Basic: Writing Classes
- Defining a class, writing accessors and mutators

Week 9: (Chapter 8)
More OOP Basics: Writing constructors - default constructors and constructors with parameters

Week 10: (Chapter 8)
A. Writing tester programs for a class
B. Objects vs Object References
C. Static Methods in a Classes

Week 11: (Chapter 14)
A. Linear Search
B. Binary Search

Week 12 (Chapter 14)
A. Selection Sort
B. Using the Java API binarySearch and Arrays.sort Methods
Week 13: (Chapter 6)
A. 2-D Arrays
B. Array Lists

Week 14:
Administrivia and Course Conclusion
CSC 1351: Introduction to Computer Science II for Majors

Sections 1-3: TTH 09:00 - 10:20 AM

class webpage: http://www.csc.lsu.edu/~duncan/courses/csc1351-f16

Instructor: William E. Duncan, Ph.D.
Office: 0159 Coates Hall
Email Address: duncan@csc.lsu.edu
Office Hours: http://www.csc.lsu.edu/~duncan/sched.htm

Course Description:

Fundamentals of Data Abstraction including the ADTs and data structures for the queue, stack, list and binary search tree. – 4 sem. hrs.

Textbook:

Required: Cay Horstmann, Big Java Late Objects Compatible with Java 5,6,7 (ISBN: 9781118087886)

Prerequisites:

1. Credit in CSC 1350 and MATH 1550.

2. Credit will not be given for both this course and CSC 1251 or 1254 or 2290 or 2390.
Goal:

To introduce students to some fundamental data structures, Abstract Data Types and searching and sorting algorithms using the object-oriented programming paradigm. By the end of this course students will:

- understand the use of references and objects in the implementation of various data structures,
- employ techniques such as abstraction and recursion in the formulation of algorithmic solutions, and
- design and analyze basic recursive and non-recursive searching and sorting algorithms.

Evaluation:

Grading will be based on five-minute unannounced short quizzes, laboratory exercises, programming projects and three exams.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Pop Quizzes</td>
<td>10%</td>
</tr>
<tr>
<td>Exam 1</td>
<td>15%</td>
</tr>
<tr>
<td>Exam 2</td>
<td>15%</td>
</tr>
<tr>
<td>Final Exam</td>
<td>20%</td>
</tr>
<tr>
<td>Laboratory Exercises</td>
<td>15%</td>
</tr>
<tr>
<td>Programming Projects</td>
<td>25%</td>
</tr>
</tbody>
</table>

Final grade will be determined by overall average as follows:

<table>
<thead>
<tr>
<th>SCORE</th>
<th>GRADE</th>
<th>SCORE</th>
<th>GRADE</th>
<th>SCORE</th>
<th>GRADE</th>
</tr>
</thead>
<tbody>
<tr>
<td>90-92.99</td>
<td>A-</td>
<td>93-96.99</td>
<td>A</td>
<td>97-100</td>
<td>A+</td>
</tr>
<tr>
<td>80-82.99</td>
<td>B-</td>
<td>83-86.99</td>
<td>B</td>
<td>87-89.99</td>
<td>B+</td>
</tr>
<tr>
<td>70-72.99</td>
<td>C-</td>
<td>73-76.99</td>
<td>C</td>
<td>77-79.99</td>
<td>C+</td>
</tr>
<tr>
<td>0-59.99</td>
<td>F</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Duncan 2 Fall 2016
Class Policies:

- **Attendance**: Attendance will only be taken on exam days. **Unannounced** short quizzes will be given during the semester. Each quiz will be based on the previous lecture or homework. **There will be no make-up for missed quizzes.** Students are responsible for all information presented in class (written and oral). It is your responsibility to obtain the notes and assignments from a willing classmate if you **MUST** miss class.

- **Collaborative Work**: Any work submitted for grading must represent your own work (and yours alone). *High standards of academic integrity are crucial for the University to fulfill its educational mission. To uphold these standards, procedures have been established to address academic misconduct.* [from LSU Code of Student Conduct]. It is assumed that all students enrolled in this course have read the Code of Student Conduct - specifically section 5.1 (Academic Misconduct) and section 8.5 (*Academic Misconduct by Undergraduate Students*) or section 8.6 (*Academic Misconduct by Graduate Students*). The Code of conduct is available at:

http://app1003.lsu.edu/slas/dos.nsf/$Content/Code+of+Conduct

- **Due Dates**: All work intended for grading must be submitted on time on the due date. Any late submission counts for no credit.

- **Missed Exam**: Students are encouraged to take every exam. In the unusual circumstances you must miss an exam due to medical reasons or other unforeseen emergencies, obtain an official excuse from the Dean's office as soon as possible. If you obtain a valid excuse from the Dean's office, the instructor reserves the right to schedule a make-up exam or allow your final exam to count for a higher percentage of your course grade.
• **Special Accommodation:** Students who have a disability that require accommodation(s) should make an appointment with the Office of Disability Services (Phone: (225)578-5919 or TDD: (225)578-2600) to discuss their specific needs and present a letter from the ODS informing the instructor of their needs. All such matters, by University regulations, are strictly confidential.

• **Cellular phone:** For the duration of each class meeting all cell phones must be turned off. They have proven to be disruptive to an effective learning environment. Do not make or receive phone calls in class.

• **Grading Corrections:** While both the GA and I will try our hardest to avoid mistakes when grading your work, we cannot rule out the possibility that an error may inadvertently occur. If you believe a mistake in grading was made, inform the instructor within five school days of receiving the grade. You will not be penalized even if no mistake occurred.

• **Exam Dates:**
  1. Exam 1 - Thursday, September 22
  2. Exam 2 - Thursday, November 3
  3. Final Exam - Thursday, December 8, 03:00 - 05:00 P.M.

• **Important Dates:**
  1. August 30 - Final day to drop without a W
  2. August 31 - Final day for adding courses and making section changes
  3. November 4 - Final day for resigning from the University and/or dropping courses
  4. December 5-10 - Final examinations
• Topics we will study: (not necessarily in this order)
  1. Objects and Classes
  2. Inheritance and Interfaces
  3. Exception Handling
  4. Recursion
  5. Algorithm Analysis Framework
  6. Sorting and Searching
  7. Parametric Polymorphism (Generics)
  8. Queue ADT
  9. Stack ADT
 10. List ADT
 11. Binary and Binary Search Trees

Problem Sets

<table>
<thead>
<tr>
<th>Topic</th>
<th>Reading</th>
<th>Exercises</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inheritance and Interfaces</td>
<td>§9.1-9.6</td>
<td>SC:1-3,7-12,11-20,29-31</td>
</tr>
<tr>
<td>Exception Handling</td>
<td>§7.4</td>
<td>SC:16-21</td>
</tr>
<tr>
<td>Recursion</td>
<td>§13.1-13.6</td>
<td>SC:3-16</td>
</tr>
<tr>
<td>Algorithm Framework</td>
<td>§14.7</td>
<td>SC:22-25; R14.3-14.9</td>
</tr>
<tr>
<td>Sorting and Searching</td>
<td>§14.1-14.6</td>
<td>SC:2-12,14-15</td>
</tr>
<tr>
<td>Generics</td>
<td>§18.1-18.4</td>
<td>SC:1-10, 13-17</td>
</tr>
<tr>
<td>Queues</td>
<td>§16.3</td>
<td>SC:13-15</td>
</tr>
<tr>
<td>Stacks</td>
<td>§15.3</td>
<td>SC:16-18</td>
</tr>
<tr>
<td>Lists</td>
<td>§16.1</td>
<td>SC:1-6</td>
</tr>
<tr>
<td>Binary Search Trees</td>
<td>§17.3-17.4</td>
<td>SC:13-20,22-24</td>
</tr>
</tbody>
</table>

Duncan 5 Fall 2016
Outline Lecture and Laboratory Content

Requirements for the CSC 1351 lab portion include lab project assignments and/or quizzes. Grading from the lab works will contribute to the overall grading based on the "Programming Projects" percentage of the grading evaluation.

Week 1
Lecture: Language review
Lab: Review arrays; Classes; Report style output; Sorting

Week 2
Lecture: Inheritance & Polymorphism
Lab: Operator and function overloading; Separate files

Week 3
Lecture: Continue Inheritance
Lab: Inheritance

Week 4
Lecture: Applets and Graphics
Lab: Applets and Graphics; Separate compilation

Week 5
Lecture: Input/Output
Lab: I/O

Week 6
Lecture: Exceptions
Lab: Exceptions

Week 7
Lecture: Object Oriented Design; Cardinality
Lab: Object Oriented Design (object relationships)

Week 8
Lecture: Recursion
Lab: Recursion

Week 9
Lecture: Introduction to Data Structures; Sorting Algorithms and Searching
Lab: ADT - Linear List

Week 10
Lecture: Introduction to Data Structures
Lab: ADT - Stack

Week 11
Lecture: Introduction to Data Structures
Lab: ADT - Queue

Week 12
Lecture: Introduction to Data Structures
Lab: ADT - Binary Search Tree

Week 13
Lecture: Recursive Traversal – Binary Search Tree
Lab: Recursive traversals

Week 14
Lecture: Review for Final Exam
Lab: Final Exam (lab portion)
CSC 2259 – Discrete Structures
Fall 2013

Course Description: (3 credit hours) Prereq.: credit or registration in CSC 1254 or 1351 and MATH 1552. Credit will not be given for both this course and MATH 2020 or EE 4740. Set algebra including mappings and relations; algebraic structures including semigroups and groups; elements of the theory of directed and undirected graphs; Boolean algebra and propositional logic; these structures applied to various areas of computer science.

Time & Location: T & Th 10:30-11:50; 1110 PATRICK TAYLOR
Instructor: Prof. Jian Zhang
Office: 3124A Patrick Taylor Hall
Email: zhang@cse.lsu.edu

Office Hours: Tuesday & Thursday 1:30-2:30pm (or by email appointment)


Course Goals: Cover fundamentals of discrete mathematics related to computer science. The discrete structures are essential in designing and analyzing efficient computer algorithms.

Learning Objectives:
1. Apply formal methods of symbolic propositional and predicate logic
2. Perform operations related to sets, functions, and relations
3. Use rules of inference to construct proofs in propositional and predicate logic
4. Explain the parallels between ideas of mathematical and/or structural induction to recursion and recursively defined structures
5. Compute permutations and combinations of a set
6. Solve a variety of basic recurrence relations
7. Calculate probabilities of events and expectations of random variables
8. Explain how concepts from graphs appear in data structures, proof techniques, and counting

Major Topics:
1. Logic: propositional logic; connectives; truth tables; propositional equivalences; quantifiers; conjunctive and disjunctive normal forms; propositional inference rules; predicate logic; proofs
2. Basic structures: sets; relations (ex. equivalence relations and partial orderings); functions; sequences; summations
3. Proof techniques: induction, implication, equivalence, converse, contrapositive, negation and contradiction
4. Recursively defined functions, sets, structural induction
5. Basics of counting: counting functions; subtraction and division rules; pigeonhole principle; permutations and combinatorics; solving basic recurrence relations
6. Discrete Probability: finite probability space and events; complements and unions; theory; conditional probability; expected value and variance
7. Graphs: terminology; models; isomorphic graphs; connectivity (undirected, directed, weighted); trees

Student Class Participation:
The class meets for a total of 3 hours per week which constitutes a 3 hour credit course. While notes and reference materials may be posted via Moodle, the class is not designed as online-based; students are expected to attend class. Absences should be rare and exceptional. Students are expected to have read the assigned chapters or pages prior to class for the background necessary to properly participate in the discussion and think critically about the concepts addressed. As a general policy, for each hour you are in class, you (the student) should plan to spend at least two hours preparing for the next class. Since this course is for three credit hours, you should expect to spend around six hours outside of class each week in activities such as reading, writing homework assignments, and/or completing programming-based exercises for the class.

Academic Integrity: The LSU Honor Code http://saa.lsu.edu/code governs all work in this course. Unless indicated otherwise, all submissions must be done only by the individual whose name appears on the submission.

Disability Services: LSU remains strongly committed to providing appropriate accommodations for students with disabilities. The LSU office of Disability Services works to provide individualized services to ensure that all students have equal access to learn and live at LSU.

Grading:
- Homework assignments: 35% (There will be 5 homework assignments)
- Midterm Exam: 30%
- Final Exam: 30%
• Attendance: 5%

Grade Scale:
A+ >= 97.0%
A  >= 94% and < 97.0
A- >= 90.0% and < 94%
B+ >= 85.0% and < 90.0%
B  >= 80.0% and < 85.0%
B- >= 75.0% and < 80.0%
C+ >= 72.0% and < 75.0%
C  >= 68.0% and < 72.0%
C- >= 65.0% and < 68.0%
D+ >= 62.0% and < 65.0%
D  >= 58.0% and < 62.0%
D- >= 55.0% and < 58.0%
F  <  55.0%

Example 14-week Outline:
Week 1. Intro and propositional logic
Week 2. Predicate logic
Week 3. Applications of logic
Week 4. Sets and functions
Week 5. Functions, sequences, sum of sequences
Week 6. Algorithms and complexity, big O (omega, theta) notion
Week 7. Recursion and recursive algorithms
Week 8. Induction, Midterm
Week 9. Advanced counting I
Week 10. Advanced counting II
Week 11. Discrete probability
Week 12. Conditional probability, Bayes theorem and its applications
Week 13. Relations, graphs
Week 14. Graphs, semester review
EE 4740 Discrete Structures for Computer Engineering

Course Number and Name
EE 4740: Discrete Structures for Computer Engineering

Credits and Contact Hours
3 credits; 3 hours lecture per week

Instructor's or Course Coordinator's Name
Ramachandran Vaidyanathan

Textbook
Other supplemental materials
• Solutions to homework and practice problems

Specific Course Information
Catalog description: Mathematical logic and proof methods; graph theory; complexity of algorithms; algebraic structures; applications in computer engineering
Prerequisites: EE 2740
Required or elective: Required

Specific Goals for the Course
This course is designed to provide the student with a basic understanding of discrete mathematics with an emphasis on topics with high applicability in computer engineering. At the end of the course the student should
• Logically infer conclusions from a given set of premises (or construct steps of a proof)
• Understand fundamental discrete structures, including sets, relations, functions and graphs.
• Be able to formally express problem specifications and assertions.
• Have a basic understanding of abstract modeling of applications.
• Approach a solution to a problem and its analysis based on formal specifications and abstract modeling.
### Student Outcomes addressed by the course

<table>
<thead>
<tr>
<th>Expected Student Outcomes</th>
<th>How to achieve Student Outcomes?</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) an ability to apply knowledge of mathematics, science, and engineering</td>
<td>Students understand and apply basic discrete structures (including logic, relations and graphs) to model and solve problems in computer engineering.</td>
</tr>
<tr>
<td>(5) An ability to identify, formulate, and solve engineering problems</td>
<td>The course teaches the tools to express and model problems in computer engineering. A set of take-home questions require the student to solve a series of problems on a specific application.</td>
</tr>
<tr>
<td>(7) An ability to communicate effectively, including conveying technical material</td>
<td>The course introduces students to a formal way of specifying problems and their solutions. The take-home problems are also graded with respect to clarity of expression.</td>
</tr>
<tr>
<td>(13) An ability to apply discrete mathematics to solve computer engineering problems</td>
<td>The course teaches discrete mathematics tools (including logic, relations, combinatorics, recurrences and graphs) to express, model, solve and analyze problems in computer engineering. A set of take-home questions require the student to solve a series of problems on a specific application.</td>
</tr>
</tbody>
</table>

### Brief List of Topics

- Mathematical logic, sets and proof methods (10 classes)
- Relations and functions, including partial orders, equivalence relations, and partitions (12 classes)
- Combinatorics and analysis of algorithms, including recurrences (8 classes)
- Topics in graph theory, including connectivity, trees and path problems (10 classes)
- Exams and quizzes (2 classes)

Revised in Fall 2014
CSC 3501 Computer Organization and Design

Fall 2017, Syllabus

Division of Computer Science and Engineering
Louisiana State University

Instructors: Kisung Lee


Catalog Course Description:
Computer arithmetic, design of high-speed adders and multipliers, CPU concepts, instruction fetching and decoding, hardwired control, microprogramming control, main memory, I/O organization, assembly language programming techniques, CPU instruction sets and addressing modes.

Prerequisites:
CSC 2259 Discrete Structures

Learning Objectives:
- Describe the basic computer architecture of modern microprocessors, memory organization, and systems terminology.
- Apply base conversion to convert between decimal, binary and hex integer formats.
- Apply understanding of binary arithmetic to perform integer arithmetic directly on binary numbers.
- Define pipelining and how definition leads to taken branches being costly.
- Apply ISA to design and test practical assembly routines on actual hardware, with inter-operation between C and assembly.
- Explain motivation and basic design of memory hierarchy.
- Define and determine if various examples display spatial and temporal locality.
- Apply cache understanding to solve problems such as: filling out cache tables, computing hit and miss rates, and/or writing a cache simulator.

Major Topics:
Overview of Computer Systems
Data Representations and Operations
Assembly Programming
Processor Architecture
Memory Hierarchy

Grading:
Exams and quizzes will account for 80% of grade, with assignments and class participation providing the balance. Grades are on a 10-point scale (i.e., 91-100 A+/A-, 81-90 B+/B-, 71-80 C+/C/C-, 61-70 D+/D/D-, <61 F). Plus/Minus grades will be uniformly distributed (e.g., 91-94 A-, 95-97 A, and 98-100 A+). If necessary, grading on a curve may be used. If a student misses any exam, a final grade of F will be given to the student. For each missed assignment of a student, the final grade of the student will be lowered by one grade (e.g., from A- to B+). Missed assignments include, but not limited to, empty code, meaningless code, and unrelated code.
Student Class Participation:
The class meets for a total of 3 hours per week, which constitutes a 3-hour credit course. While notes and reference materials may be posted via Moodle, the class is not designed as online-based; students are expected to attend class. Absences should be rare and exceptional. Students are expected to have read the assigned chapters or pages prior to class for the background necessary to properly participate in the discussion and think critically about the concepts addressed. As a general policy, for each hour you are in class, you (the student) should plan to spend at least two hours preparing for the next class. You should expect to spend around six to eight hours outside of class each week in activities such as reading, writing homework assignments, and/or completing programming-based exercises for the class.

Exams and Quizzes:
There will be two or three exams (one of which is the final). The final exam will be held on Wednesday, December 6, 2017 at 5:30PM-7:30PM, in the room in which we hold lectures. Other exam dates will be announced at least one week in advance. In addition, there will be quizzes that can occur during lectures. A grade of zero will be recorded for missed quizzes unless prior arrangements are made (only allowed in extraordinary circumstances).

Assignments:
There will be several programming assignments, and their due date will be announced at least one week in advance. Students are expected to be able to explain the workings of their own programs, and may be called upon to do so. If they cannot, no credit will be given for that assignment. Assignments turned in after the due date will be penalized 20% per day. Assignments that are submitted later than three days after the due date will result in a grade of zero.

Cheating:
Students are encouraged to discuss programs in a general way to gain greater insight. Copying another's code, writing code for someone else, or allowing another to copy your code are cheating, and can result in a grade of zero for all parties. Therefore, take precautions so that your old printouts, unattended screen, etc. are not available to other students. Discussing the details of the solution or showing/examining actual code are not acceptable. If you are in doubt whether an activity is permitted collaboration or cheating, ask the instructor.

Decorum:
Students are expected to refrain from side conversation or other distracting behavior in class. Students should arrive on time for class; if late, come in quietly with a minimum of disturbance. Electronic communications (e.g., emailing, instant messaging, phone calls, facebooking, tweeting) are not allowed in class. During testing, any such communications may result in a grade of zero. Violations of this policy will be also reported to the Office of the Dean of Students.

Email:
Questions about lectures, assignments, and course organization may be sent to the professor or TA. We cannot guarantee an immediate response, but will address the issue through direct response, general announcement, or a suggestion to visit during office hours. Last minute questions (i.e., sent the night before an assignment is due) may not be answered before the deadline, so tackling problems early is encouraged.

Regrading:
If you believe we have made an error in grading your exam, quiz or assignment, you may submit the graded work along with a written request for reconsideration within seven days from the completion of grading. You must explain in writing clearly and succinctly the reasons your grade should be changed. In fairness to other
students, we cannot vary the grading criteria on an individual basis, though suggestions may be taken into consideration for future classes.

**Disability:**
If you have a physical, psychological, medical or learning disability that may impact on your ability to carry out assigned course work, I would urge that you contact University Disability Services (DS), 115 Johnston Hall (225-578-5919, disability@lsu.edu, http://disability lsu.edu/). Please bring a letter to me from the DS indicating your need for academic accommodations within the first week of class. The syllabus and other class materials can be made available in alternative format upon request.
### 14-Week Outline:

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
<th>Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Course Overview</td>
<td>Chap. 1</td>
</tr>
<tr>
<td></td>
<td>Bits and Bytes</td>
<td>Chap. 2.1</td>
</tr>
<tr>
<td>2</td>
<td>Integer Representations</td>
<td>Chap. 2.2</td>
</tr>
<tr>
<td>3</td>
<td>Integer Arithmetic</td>
<td>Chap. 2.3</td>
</tr>
<tr>
<td>4</td>
<td>Floating Point</td>
<td>Chap. 2.4</td>
</tr>
<tr>
<td>5</td>
<td>Machine Programs: Basics</td>
<td>Chap. 3.1-3.4</td>
</tr>
<tr>
<td></td>
<td>Machine Programs: Arithmetic</td>
<td>Chap. 3.5</td>
</tr>
<tr>
<td>6</td>
<td>Machine Programs: Control</td>
<td>Chap. 3.6</td>
</tr>
<tr>
<td>7</td>
<td>Machine Programs: Procedures</td>
<td>Chap. 3.7</td>
</tr>
<tr>
<td>8</td>
<td>Review and Midterm</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Machine Programs: Arrays</td>
<td>Chap. 3.8</td>
</tr>
<tr>
<td></td>
<td>Machine Programs: Structures</td>
<td>Chap. 3.9</td>
</tr>
<tr>
<td>10</td>
<td>Storage Technologies</td>
<td>Chap. 6.1</td>
</tr>
<tr>
<td></td>
<td>The Memory Hierarchy</td>
<td>Chap. 6.2-6.4</td>
</tr>
<tr>
<td>11</td>
<td>Cache Memories</td>
<td>Chap. 6.4-6.7</td>
</tr>
<tr>
<td>12</td>
<td>Cache Memories</td>
<td>Chap. 6.4-6.7</td>
</tr>
<tr>
<td></td>
<td>Instruction Set Architecture</td>
<td>Chap. 4.1-4.3</td>
</tr>
<tr>
<td>13</td>
<td>Sequential Implementation &amp; Pipelining</td>
<td>Chap. 4.3-4.4</td>
</tr>
<tr>
<td></td>
<td>Pipelined Implementation</td>
<td>Chap. 4.5</td>
</tr>
<tr>
<td>14</td>
<td>Review</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Final Exam</td>
<td></td>
</tr>
</tbody>
</table>
EE 3755 Computer Organization
Fall 2017

Instructor:
Sam Irving, email: sirvin1@lsu.edu
Roozbeh Karimi, email: rkarim2@lsu.edu

Class Time and Location:
4:30-7:20PM W 109 TUREAUD HALL

Office hours:
Sam Irving: 1:30–4:30PM W 201 EE Building (weeks 1-7)
Roozbeh Karimi: TBA (weeks 8+)

Catalog Course Description: Structure and organization of computer systems; instruction sets; arithmetic; data path and control design.

Prerequisites: EE2740 or equivalent.

Text:
Required: Computer Organization and Design, 5th Edition: The Hardware/Software Interface,
Author(s): David Patterson & John Hennessy,
Release Date: 26 Sep 2013
Imprint: Morgan Kaufmann
Print Book ISBN: 9780124077263
eBook ISBN :9780124078864

Optional Reference:
Brown & Vranesic, “Fundamentals of Digital Logic with Verilog Design.” (The textbook used in EE 2720, 2730, and 2740.)

Topics:
1. Computer Abstractions and Technology
2. Instructions
3. Arithmetic for Computers
4. Processor
5. Logic Design and Verilog

Policy and Procedures:
• Homework.
  o Students will submit homework individually in the following format:
    ▪ Begin each problem in a new page.
    ▪ Number the pages as follows: 1 of 5, 2 of 5, … , 5 of 5.
    ▪ The problems should be submitted in the same order as in the assignment.
    ▪ Staple the pages and fold them vertically.
    ▪ Write your name on the outside.
    ▪ In order to encourage you to follow the instructions given above, 2 points will be deducted for each of the instructions which are not followed.
  o The student will be given the opportunity to submit late homework until the second class after the homework’s due date. Late homework will be penalized 10% of the original maximum grade for each day it is late.
  o All homework assignments are due at the end of classes.
• **Exams.**
  o All exams will be closed notes.

• **Quizzes and classroom assignments**
  o There will be quizzes or group class assignments and they may be in the beginning, middle or end of the class.

• **Test, homework, quiz, classroom assignment, and laboratory report grading.**
  o If you believe an error was made in grading your assignment, you should write a short justification of your claim and attach it to the original assignment. Hand it to your instructor or slide it under his office door within one week of it being returned to you.

• **Make-ups on Exams and Quizzes.**
  o If you miss an exam or quiz without either a medical excuse or prior instructor approval, you will not be given a make-up.

• **Grading:**
  o Homework, Quizzes and Classroom Assignments: 15%
  o 1 Midterm Test – Oct. 4th, Wednesday in class: 35%
  o Final – M Dec. 4, 5:30 - 7:30 PM: 50%

• **Grading Scale:**
  o A+ ≥ 97, A ≥ 93, A- ≥ 90
  o B+ ≥ 87, B ≥ 83, B- ≥ 80
  o C+ ≥ 77, C ≥ 73, C- ≥ 70
  o D+ ≥ 67, D ≥ 63, D- ≥ 60
  o F < 60

Plus/Minus Grades Guidance
https://sites01.lsu.edu/wp/registraroffice/academics/plusminus-grades-guidelines/

• **Curving:**
  o At the discretion of the instructor a grading curve may be used to allow for a more favorable grade distribution
Date: Thu, 28 Sep 2017 19:09:01 +0000 Download RE: REMINDER Fw: CSE: RESPONSE REQUESTED Change to LSU Catalog Course Description CSC 2259.msg
From: John D Scalzo <jscalz1@lsu.edu> Import addresses jscalz1@lsu.edu Block email jscalz1@lsu.edu Block SMTP relay CY1PR0601MB1035.namprd06.prod.outlook.com
To: Coretta Douglas douglas@cs.csc.lsu.edu
CC: Jerry L Trahan jtrahan@lsu.edu
Subject: RE: REMINDER Fw: CSE: RESPONSE REQUESTED Change to LSU Catalog Course Description CSC 2259

Coretta,
The division of electrical and computer engineering acknowledges and approves of the change to the catalog course description of CSC 2259.

John Scalzo, MSEE
Senior Instructor, Undergraduate Adviser
Division of Electrical and Computer Engineering
Louisiana State University
3335 Patrick F. Taylor Hall, Baton Rouge, LA 70803
office 225-578-5478
www.ece.lsu.edu/fac/Scalzo.html

**** ........ ****

>> Forwarded Message <<

>> From: "Coretta Douglas" douglas@www.csc.lsu.edu
>> To: "Scalzo, John D" <jscalz1@lsu.edu>, Charles Delzell
>> Cc: "Busch, Konstantin" busch@csc.lsu.edu
>> Subject: CSE: RESPONSE REQUESTED Change to LSU Catalog Course
>> Description CSC 2259
>>

>> Dear Chip and John,
>> As you know, we are working on curriculum forms to change the LSU
>> General Catalog description for CSC 2259 to prohibit students from
>> receiving credit in CSC 2259 and MATH 2020 or EE 4740. See the
>> attached Form C for CSC 2259.
>> (1) Please reply to this email with your department's response to
>> the change.
>> (Approved, Not Approved, or request for more information).
>>
>> (2) Please provide a detailed syllabus for your relevant course:
>> MATH 2020 (Delzell) and EE 4740 (Scalzo). As a reminder, do include
the 14-week lecture and a statement of the student's expected participation in the course on your syllabus. See attached CSC 2259 syllabus.

Heads-up:

Curriculum change forms will be forthcoming.

For our 4 concentrations, we intend to add to the catalog descriptions (and the programming of the degree audits), that CS majors may receive credit for EE 4740 as a substitution for CSC 2259. Subsequent to previous communication with the Mathematics department, we will NOT include MATH 2020 in the list of approved substitutions for CSC 2259.

See the last statement in the Justification to CSC 2259 (Form C):

"The Mathematics Department has declined to accept CS majors in MATH 2020 classes as an alternative due to restricted faculty resources.

We will continue to work individually with students who have earned credit in MATH 2020 [such as MATH majors] and are pursuing either a CS dual major or the CS minor for accommodations on an exception basis."

Much appreciated,

Coretta Douglas, Ph.D. Computer Science Undergraduate/Instructional Coordinator and Instructor Patrick F.

Taylor 3270-A ** Division of Computer Science and Engineering **

School of Electrical Engineering and Computer Science

------ End of Forwarded Message ------
ECE approves of this substantiation.

John Scalzo, MSEE
Senior Instructor, Undergraduate Adviser
Division of Electrical and Computer Engineering
Louisiana State University
102 South Campus Drive 150-E, Baton Rouge , LA 70803
office 225-578-5478
www.ece.lsu.edu/fac/Scalzo.html

-----Original Message-----
From: Coretta Douglas [mailto:douglas@csc.lsu.edu]
Sent: Wednesday, October 18, 2017 12:54 PM
To: John D Scalzo <jscalz1@lsu.edu>
Cc: Busch, Konstantin <busch@csc.lsu.edu>; Jerry L Trahan <jtrahan@lsu.edu>
Subject: CSE: Response Requested - Curriculum Change RE: CSC 3501 & EE 3755

Dear John,
CSE is proposing curriculum changes that involve credit in EE 3755 applied toward the (1) computer science major and the (2) computer science minor. A timely response from the Division of Electrical and Computer Engineering is needed.

Please respond with either favorable reply (approved) or with substantiation if you object to the 2 changes.
(1) We have been informed by ABET (abet.org) that the computer science curriculum is not restricted to a minimum of 40 credit hours of CSC coursework. ABET instead requires at least 40 cr. hrs. of computer science "subject content"; we have the flexibility to substitute other department's coursework that covers the content of the CSC equivalent.
Currently, for CS majors with earned credit in EE 3755, we require a computer science (CSC) course CSC 3000-level and above to substitute for CSC 3501. The requirement was needed to ensure that CS majors, particularly in the 2nd Discipline concentration, had the minimum of 40 cr. hrs. of CSC coursework.
With approval of the proposed change, the degree audits (all concentrations) will be programmed to permit credit in either CSC 3501 or EE 3755. The LSU General Catalog states that students may not receive credit for both CSC 3501 and EE 3755.

(2) CSC 3501 is required for the minor in computer science. After manual review, by the CSE academic adviser, a counselor in the College of Engineering is informed of the approved substitution EE 3755 for CSC 3501 in the declared computer science minor. The Counselor then must manually make the change to the student's degree audit. We
are making the substitution explicit in the LSU General Catalog description for the computer science minor.

See attached documents.
Regards,
Coretta

Coretta Douglas, Ph.D. Computer Science
Undergraduate/Instructional Coordinator and Instructor
Patrick F. Taylor 3270-A
** Division of Computer Science and Engineering **
School of Electrical Engineering and Computer Science

7/91
Date: Fri, 18 Aug 2017 09:28:49 -0500
From: "Coretta Douglas" <douglas@apple.com>
To: Charles Delzell <mmezz@lsu.edu>, Coretta Douglas <douglas@csc.lsu.edu>
CC: "Scalzo, John D" <jscalz1@lsu.edu>, Oliver Dasbach <kasten@math.lsu.edu >
Subject: Re: Discrete Structures?

Dear Chip and Friends, Good morning.
I have included Dr. Busch (acting CSE Chair) who is to open discussion in our
next faculty meeting regarding this topic.

2. Yes, I would like to put into the LSU catalog, that students may receive
credit in only one of the following CSC 2259, MATH 2020 and EE 4740.
Currently, LSU students can receive credit in both. Consider CSE major, Cole
Land. He has credit in CSC 2259 (required) and MATH 2020 (counting as a tech
elective).

3. Yes, I would like to discuss adding a statement in the degree audits giving
students a choice of the three.
CSC 2259, MATH 2020 or EE 4740 WITH GRADE OF C OR ABOVE - 3 HRS

4. YOU ARE RIGHT!
My statement that enrollment in MATH 2020 or EE 4740 would not change was
frivolous. I was narrow-minded.
I was considering particularly the following:
- For Electrical Engineering and Computer Engineering students with credit in
  EE 4740, the course would auto-apply to the CS minor.
- For Math dual majors intending to minor in CS or dual major in CS, MATH 2020
  would apply as a substitution for our CSC 2259.
You are correct. Some CS majors would prefer to enroll in MATH 2020. I cannot
estimate how many would make that choice. I heard you loud and clear that
mathematics does not want MATH 2020 to become a service course.

Would you be inclined to change your catalog description for MATH 2020 (#2
above), to include: "students may receive credit in only one of the following
CSC 2259, MATH 2020 and EE 4740". College counselors would then be able to
make appropriate substitutions on degree audits as an exceptions.

I cannot tell you how appreciative I am of your careful consideration and
response pertaining to our upcoming discussion.

Regards,
Coretta

On Fri, 18 Aug 2017 07:13:04 -0500, Charles Delzell wrote
> Dear Coretta,
> 
> Thanks for the heads-up.
> 
> 1. I think you attached the syllabus of CSC 2259 twice.
> 
> 2. You say you expect to "change the catalog description;"
> I suppose you mean the catalog description of CSC 2259;
> but you do not say how you expect to change it.
> I guess a student can currently get credit
> in CSC 2259, MATH 2020 and EE 4740;
none of these courses are listed as duplicates of the others.
Do you want to change that?

3. You also say you expect to "modify our degree audits";
I suppose you mean you expect to change the CSC curriculum
(including all 4 concentrations therein), as follows:
In semester 3, change "CSC 2259" to
"Either CSC 2259, MATH 2020 or EE 4740."
Right?

4. You say you do not anticipate that enrollment
numbers in Math 2020 or EE 4740 will change. Why?
Here is the 14th-day enrollment history of those 3 courses:

Math  EE  CSC
Fall 2020  4740  2259
--- --- ---
2017 44* 0 119* *as of today
2016 21 0 124
2015 24 0 109
2014 35 0 96
2013 32 0 38
2012 36 0 45

Math  EE  CSC
Sprng 2020  4740  2259
--- --- ---
2017 30 36 53
2016 29 34 63
2015 35 44 71
2014 43 44 61
2013 33 29 22
2012 45 15 30

On the contrary, we do anticipate that enrollment
in Math 2020 or EE 4740 will change (higher).

Almost all students in Math 2020 are math majors.
We don't want to transform Math 2020
into a service course for CSC.

Math 2020 is one of our 3 "bridge courses":
Math 2020 Solving Discrete Problems;
Math 2025 Integral Transforms and Their Applications; and
Math 2030 Discrete Dynamical Systems.

Math majors must take 2 of those 3.
The purpose of those 3 is to show students how
to write proofs, in preparation for 4000-level
math courses (most of which are proof-intensive).
The content of these three courses is secondary for Math.
For CSC, by contrast, I suspect that the content is primary.

Sincerely,
Chip
> Subj: CSE: Response Requested - Inquiry Discrete Structures?
> Date: Fri, 11 Aug 2017 15:42 -0500
> From: Coretta Douglas <douglas@csc.lsu.edu>
> To: O'Bannon (LSU Mathematics Undergraduate Adviser),
>     Soula <soula@math.lsu.edu>, Scalzo, John D <jscalz1@lsu.edu>,
>     delzell@math.lsu.edu
> CC: Busch, Konstantin <busch@csc.lsu.edu>, karki@csc.lsu.edu
> Dear
> John Scalzo (Undergraduate and Academic Advisor for EE and ECE)
> Charles "Chip" Delzell (Mathematics Assoc. Chair for Instruction)
> Soula O'Bannon (Mathematics Undergraduate Adviser)
> cc: Dr. Karki (Chair Computer Science & Eng)
>     Dr. Busch (Acting Chair for Computer Science & Eng)
>
> Our accreditation agency (abet.org) has placed CSC 2259
> Discrete Structures in the mathematics category; discrete structures
> in no longer regarded (counted) as a computer science course.
> Therefore we are no longer compelled to restrict credit in only
> CSC 2259 as required for our majors. We are asking for your
> initial feedback before discussion is opened with our faculty,
>
> 1. to permit for all CSC concentrations, 
>    credit in only one of the following:
>    CSC 2259, MATH 2020 or EE 4740.
>>
> 2. to permit one of the above for the CS minor.
>
> Currently non-CS students must take a credit test in CSC
> 2259 after having earned credit in MATH 2020 or EE 4740!
> We expect that by changing the catalog
> description and modifying our degree audits,
> we will better align with your curricula.
> We do not anticipate that enrollment numbers
> in MATH 2020 or EE 4740 will change.
> See the attached master course syllabus for CSC 2259.
> This email is a preliminary inquiry to solicit your input as
> we take the proposal to our faculty at large for discussion.
> Subsequent to support of the CSE faculty,
> formal C&C documents will be routed for
> your approval per the normal C&C process.
>
> So what is your reaction? Any suggestions?
> Please reply by Friday, August 18th.
>
> Thank you, Coretta
>
> Coretta Douglas, Ph.D. Computer Science
> Undergraduate/Instructional Coordinator and Instructor
> Patrick F. Taylor 3270-A
> Division of Computer Science and Engineering
> School of Electrical Engineering and Computer Science
Coretta Douglas, Ph.D. Computer Science
Undergraduate/Instructional Coordinator and Instructor
Patrick F. Taylor 3270-A
** Division of Computer Science and Engineering **
School of Electrical Engineering and Computer Science