## Present Course Description

<table>
<thead>
<tr>
<th>Title</th>
<th>Advanced Data Structures and Algorithm Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Semester Hours of Credit</td>
<td>3</td>
</tr>
<tr>
<td>Lecture:</td>
<td>Lab/Sem/Rec:</td>
</tr>
</tbody>
</table>

Repeat Credit Max. (if repeatable):  
Graduate Credit? Yes  
Credit will not be given for this course and:  
Contact Hours Per Week: (Indicate hours in appropriate course type.)  
Lecture  
Lab  
Seminar  
Recitation  
Intern  
Res/Ind  
Clin/Pract  
Total Weekly Contact Hours: 3  
Grading System: Letter Grade X  
Course Description: (Include course number, title, etc. exactly as it appears in the General Catalog)  

CSC 3102 Advanced Data Structures and Algorithm Analysis (3)  
Prereq.: CSC 1254 or 1351 and credit or concurrent enrollment in CSC 2259 or EE 2740. Description and utilization of formal ADT representations, especially those on lists, sets, and graphs; time and space analysis of recursive and nonrecursive algorithms, including graph and sorting algorithms; algorithm design techniques.

## Proposed Course Description

<table>
<thead>
<tr>
<th>Title</th>
<th>Advanced Data Structures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short Title</td>
<td>A D V D A T A S T R U C T U R E S</td>
</tr>
<tr>
<td>Lecture</td>
<td>Lab/Sem/Rec:</td>
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Repeat Credit Max. (if repeatable):  
Graduate Credit? Yes  
Credit will not be given for this course and:  
Contact Hours Per Week: (Indicate hours in appropriate course type.)  
Lecture  
Lab  
Seminar  
Recitation  
Intern  
Res/Ind  
Clin/Pract  
Total Weekly Contact Hours: 3  
Grading System: Letter Grade X  
Course Description: (Include course number, title, etc. exactly as it appears in the General Catalog)  

CSC 3102 Advanced Data Structures and Algorithm Analysis (3)  
Prereq.: CSC 1254 or 1351 and credit or concurrent enrollment in CSC 2259 or EE 2741. Description and utilization of formal ADT representations, especially those on lists, sets, and graphs; time and space analysis of recursive and nonrecursive algorithms, including graph and sorting algorithms; algorithm design techniques.

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**These questions must be answered completely and accurately or proposal will be returned.**

Has this change been discussed with and approved by all departments/colleges affected? Yes X No N/A.  
Is this course included in any curricula, concentrations, or minors? Yes X No  
If yes, please list on a separate sheet.  
Is this course a prerequisite or corequisite for other courses? Yes X No  
If yes, list courses; use separate sheet.  
Is this course on the General Education list? Yes X No  

**Justification/Explanation:** Use separate sheet.  
**Note:** IF COURSE IS OR WILL BE CROSS-LISTED, SEPARATE FORMS MUST BE SUBMITTED BY EACH DEPARTMENT.

## Approvals

<table>
<thead>
<tr>
<th>Department Faculty Approval Date</th>
<th>OCT 11, 2017</th>
<th>College Faculty Approval Date</th>
<th>11/17</th>
</tr>
</thead>
<tbody>
<tr>
<td>Department Chair Signature</td>
<td>10/18/2017</td>
<td>College Dean Signature</td>
<td>11/17</td>
</tr>
<tr>
<td>Graduate Dean Signature</td>
<td>(date)</td>
<td>Chair, FS C&amp;G Committee</td>
<td>11/30/17</td>
</tr>
<tr>
<td>College Contact E-mail</td>
<td></td>
<td>Academic Affairs Approval (date)</td>
<td></td>
</tr>
</tbody>
</table>

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Instructions for Form C - Request for Changing a Course

CHANGE:
To change one of the two co-requisites from EE 2740 to EE 2741.

REQUIRED IN CURRICULA
CSC 3102 is required for all concentrations in the Computer Science major.
CSC 3102 is required in the curriculum in Computer Engineering.
CSC 3102 is required for the minor in Computer Science

PREREQUISITE
EE 4730
EE 4775
EE 4790
EE 7755
EE 7780
CSc 3200
CSC 3991
CSC 4101
CSC 4103
CSC 4263
CSC 4330
CSc 4356
CSC 4402
CSC 4444
CSC 4501
CSC 4585
CSC 4700
CSC 7375
CSC 7481

JUSTIFICATION:
EE 2720 is one of two possible co-requisites for CSC 3102; the other co-requisite is CSC 2259. EE 2720 has been deleted from the catalog (2012).
For the 2018-2019 a new course proposal, EE 2741, similar to EE 2720, will incorporate lecture and lab components into a single course. The majority of EE 2720 is contained in the proposed course, EE 2741.
Instructions for Form C - Request for Changing a Course

CSC 3102 Section 1 Advanced Data Structures & Algorithm Analysis
Fall 2015

Catalog Description: Prereq.: CSC 1254 or CSC 1351 and credit or concurrent enrollment in CSC 2259 or EE 2741. Description and utilization of formal ADT representations, especially those on lists, sets and graphs; time and space analysis of recursive and nonrecursive algorithms, including graph and sorting algorithms; algorithm design techniques.

Time & Place: Tuesday & Thursday 1:30 – 2:50 pm Tureaud Hall 206

Instructor: Dr. Mingxuan Sun
Email: msun11@lsu.edu
Office: Electrical Engineering Building 321
Office Hours: Tuesday & Thursday 3:00 – 4:00 pm

TA: Shungeng Zhang
Email: szhan45@lsu.edu

Prerequisites: CSC 1254 or CSC 1351 and credit or concurrent enrollment in CSC 2259 or EE 2740.

Course Overview: Description and utilization of formal abstract data type (ADT) representations, especially those on lists, trees and graphs; time and space analysis of recursive and non-recursive algorithms, including search, sorting and graph algorithms; algorithms design techniques;

Text:

Learning Objectives:
1. Critique an algorithm and determine its correctness and time complexity
2. Distinguish various algorithm design techniques (brute-force, divide and conquer, greedy, etc.)
3. Implement a variety of advanced data structures
4. Design and create programming solutions applying specific algorithm design techniques and data structures to solve problems.
Instructions for Form C - Request for Changing a Course

Major Topics: This course assumes the student has completed a robust 2-course introduction to programming syntax and data structures (list, stack, queue and binary search tree; recursion) using an object oriented language (C++ or Java).
1. Brief review of basic data structures.
2. Introduction to basic concepts of algorithms.
3. Introduction and comparison of the efficiency of various sorting algorithms including the insertion sort, selection sort, quick sort, merge sort.
5. Advanced searching methods, tree traversals (pre-order, post-order, in-order), and implementation.
6. Advanced tree data structures including binary search trees and AVL trees.
7. String matching, combinatorial problems, greedy techniques and dynamic programming.
8. Graph-related algorithms (depth-first and breadth-first traversal), minimum spanning trees, topological sorting, shortest path.
10. Sets, dictionaries and maps including hash tables.

Grading/Evaluation:
Homework (3) 
Programming Assignments (3) 15% 20%
Midterm 25% (1:30-2:50 PM, Th Oct. 15)
Final 40% (3:00-5:00 PM, T, Dec. 08)

A+ >= 100.0% A >= 93.3% A- >= 90.0%
B+ >= 86.6% B >= 83.3% B- >= 80.0%
C+ >= 76.6% C >= 73.3% C- >= 70.0%
D+ >= 66.6% D >= 63.3% D- >= 60.0% F < 60.0%

Classroom Policies:
A. General Policy: Students are expected to attend classes regularly. Students are responsible for all announcements made in class, by email, and/or posted to Moodle. All homework will be submitted in class on the due date. All programming projects will be submitted via your account on classes.csc.lsu.edu. All grade appeal must be made within 3 class days following the return of graded work. Grades are recorded on the course Moodle.
B. Email: Check email frequently for additional instructions. Questions may be sent to the professor or TA by email. Last minute questions (i.e. sent the night before due date) may not be answered, so tackling problems early is encouraged.
C. Programming Project: Submit your code via classes.cse.lsu.edu. Keep your account and password safe. You are responsible for any consequence such as late submission penalty due to account/password reset.
D. Late Submission: 10% points off, if submitted within 24 hours after the due date; 25% off, if submitted 24-48 hours after the due date; no credit if submitted two days or more days after the due date unless prior arrangements are made with the instructor with acceptable reasons.
E. Exams: There will be no make-ups except under very special circumstances. Any reason for a make-up must be approved by the instructor.
F. 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.
Instructions for Form C - Request for Changing a Course

G. 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.

H. 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.

14-Week Lecture Outline:
Week 1:
A. Administrivia: Overview of the course and syllabus
B. Math Review: logarithms and its properties, limits, arithmetic series (needed for asymptotic notations covered in week 2)

Week 2: Asymptotic Notations
A. Big O, Omega and Theta
B. Analysis of Elementary Algorithms: insertion sort, selection sort, linear search and binary search

Week 3: Recursive Sorting Algorithms
A. Merge Sort
B. Quick Sort

Week 4: Basic Data Structures
A. Introduction to Trees
B. Review of Binary and Binary Search Trees
C. Heaps and Priority Queues

Week 5: More Data Structures
A. Deletion in Binary Search Trees
B. AVL Trees: Definition, insertion and related rotations

Week 6:
A. AVL Tree Deletion
B. Recursion and Dynamic Programming

Week 7: Introduction to Graphs
A. Definition and basic terms
B. Graph representations: adjacency matrix, adjacency list

Week 8:
A. Basic Graph Operations for an adjacency list; representation of a graph
B. Graph traversal:
   i. Review of queues
   ii. breadth-first-search
   III. Review of stacks
   iv. depth-first-search traversal
Instructions for Form C - Request for Changing a Course

Week 9: Shortest Path Algorithms
A. Dijkstra's Algorithms
B. Floyd's Algorithms

Week 10: Minimum Spanning Trees Algorithms
A. Prim's Algorithms
B. Kruskal's Algorithms

Week 11: String Matching Algorithms
A. Naive String Matcher
B. KMP Algorithms

Week 12: Hashing
A. Closed and Open Addressing

Week 13: Any other advanced data structure, time permitting: tries, B-trees

Week 14: Course conclusion and administrivia
Date: Thu, 28 Sep 2017 20:43:05 +0000
From: Ramachandran Vaidyanathan <vaidy@lsu.edu>
To: John D Scalzo <jscalz1@lsu.edu>, Coretta Douglas <douglas@csc.lsu.edu>
CC: Jerry L Trahan <jtrahan@lsu.edu>, Ramachandran Vaidyanathan <vaidy@lsu.edu>
Subject: RE: REMINDER Fw: CSE: RESPONSE REQUESTED Change to LSU Catalog Course Description CSC 2259

Coretta,

I understand, EE 2740 (Digital Logic) is currently the prerequisite to CSC 3102. EE 2740 was the first of a 2-course sequence of which EE 2740 was the lecture part and the second course (EE 2731) was the lab. We are now in the process of replacing the EE 2740, 2731 sequence by a new EE 2741, 2741 sequence in which the lecture and lab components are included in both courses.

To help you decide which of the two new courses should be the prerequisite to CSC 3102, here is a brief description.

- Collectively, the new sequence covers almost the same material as the old sequence
- EE 2741, the first course in the new sequence covers the essential elements of combinational logic and the basics of sequential logic.

If you need further clarification or have questions about the coverage of specific topics, please let me know.

Thanks
Vaidy

-----Original Message-----
From: John D Scalzo
Sent: Thursday, September 28, 2017 2:45 PM
To: Coretta Douglas <douglas@csc.lsu.edu>; Ramachandran Vaidyanathan <vaidy@lsu.edu>
Cc: Jerry L Trahan <jtrahan@lsu.edu>
Subject: RE: REMINDER Fw: CSE: RESPONSE REQUESTED Change to LSU Catalog Course Description CSC 2259

Vaidy - please correspond with Coretta about CSC 3102. The current prerequisite of CSC 3102 is EE 2740. So depending on what they need exactly, they must change this to EE 2741 or 2742, since we will be deleting EE 2740.

I am not sure we can move the proposal forward without a form C from CSC.

- John

-----Original Message-----
From: Coretta Douglas [mailto:douglas@csc.lsu.edu]
Sent: Thursday, September 28, 2017 2:40 PM
To: John D Scalzo <jscalz1@lsu.edu>
Subject: RE: REMINDER Fw: CSE: RESPONSE REQUESTED Change to LSU Catalog Course Description CSC 2259
Computer Science & Engineering  
College  
College of Engineering  
Date  September 22, 2017

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<tr>
<td>Short Title (≤ 19 characters)</td>
<td>M A L W A R E A N A L Y S I S R E V E R S E E N G I N E E R I N G</td>
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<tr>
<td>Semester Hours of Credit</td>
<td>3 credit hours</td>
</tr>
<tr>
<td>If combination course type, # hrs. of credit for</td>
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<tr>
<td>Lecture:</td>
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<tr>
<td>Repeat Credit Max. (if repeatable):</td>
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<tr>
<td>credit hours</td>
<td>Graduate Credit?</td>
</tr>
<tr>
<td>Credit will not be given for this course and:</td>
<td></td>
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<td>Lecture</td>
<td>Lab</td>
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<tr>
<td>3</td>
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<tr>
<td>Maximum enrollment per section: (use integer, e.g. 25 not 20-30)</td>
<td>30</td>
</tr>
<tr>
<td>Grading System:</td>
<td>Letter Grade</td>
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<tr>
<td><strong>(Attach justification if the proposed course will not hold a final exam during examination week.)</strong></td>
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**Course Description:**  
(Concise catalog statement exactly as you wish it to appear in the General Catalog)

CSC 4360 Malware Analysis and Reverse Engineering (3)  
*Prereq.: CSC 4103 or equivalent.* Legal and ethical issues; categorization of malware; static methods for malware analysis and reverse engineering, including disassembly and decompilation; dynamic analysis strategies including debugging, sandboxing, and binary instrumentation; circumvention of obfuscation and anti-analysis techniques.

**BUDGET IMPACT (IF ANSWER TO ANY QUESTION IS “YES”, ATTACH EXPLANATION.**

| If this course is approved, will additional staff be needed? | Yes | No |
| Will additional space, equipment, special library materials or other major expense be involved? | Yes | No |

Academic Affairs Approval:  
(Date)

**ATTACHMENTS (ATTACH THE FOLLOWING TO YOUR PROPOSAL)**

JUSTIFICATION: Justification must explain why this course is needed and how it fits into the curricula. Will the course duplicate other courses?  
SYLLABUS: Including 14 week outline of the subject matter; titles of text, lab manual, and/or required readings; grading scale and criteria  
(For 4000-level, specify graduate student grading criteria if requirements differ for graduate and undergraduate students).

**APPROVALS**

Department Faculty Approval Date Feb. 24, 2017  
College Faculty Approval Date  
Department Chair Signature  10/31/2017  
Graduate Dean Signature  (date)  
Coretta Douglas, Douglas@csc.lsu.edu  
College Contact  E-mail  
College Dean Signature  (date)  
Chair, PS CSS Committee  (date)  
Academic Affairs Approval  (date)
CSC 4360 Malware Analysis (3)
Prereq.: CSC 4103 or equivalent. Legal and ethical issues; categorization of malware; static methods for malware analysis and reverse engineering, including disassembly and decompilation; dynamic analysis strategies including debugging, sandboxes, and binary instrumentation; circumvention of obfuscation and anti-analysis techniques.

Justification:
Software reverse engineering is a critical area in cybersecurity, with applications in software patch verification, software interoperability, the analysis of malicious software, and cyberwarfare. Furthermore, reverse engineering skills are now routinely required in digital forensics investigation and incident response. There is a huge shortage not only in the US but also internationally of cybersecurity professionals with reverse engineering skills. Notably, the most prestigious NSA/DHS academic designations (e.g., Center of Academic Excellence in Cyber Operations or CAE-CO) require a malware reverse engineering course in a designated university’s curricula.
CSC 4360
The Courses and Curriculum (C&C) Committee of the Division of Computer Science and Engineering (CSE), is currently discussing various approaches toward formalizing a curricula focus in cybersecurity. With the expected hiring of a CSE professor in the research area (interviews Spring 2018), we anticipate developing additional undergraduate courses related to the area. CSC 2700 Special Topics "Introduction to Cybersecurity" will be targeted as the 2nd undergraduate course offering to be refined and proposed for the catalog. Most prominent in the discussion has been the creation of a 5th concentration, "Cybersecurity"; initially, CSC 4360 will be required in the concentration as well as the 2000-level introductory course. Our timeline is for proposal in the catalog early fall 2018 for inclusion in the 2018-2019 catalog.

Cybersecurity is a critical area in technology development and software engineering. Breeches in security may have devastating results. Our Industry Advisory Council has strongly urged continued and increased emphasis on the topic. Students attending the recent Kick-off sessions demonstrate a marked increased interest in cybersecurity; the course offering is important toward recruitment and retention of our majors.
SYLLABUS

CSC 4360 Malware Analysis and Reverse Engineering

Catalog Description:
CSC 4360 Malware Analysis and Reverse Engineering (3 credit hours) Legal and ethical issues; categorization of malware; static methods for malware analysis and reverse engineering, including disassembly and decompilation; dynamic analysis strategies including debugging, sandboxes, and binary instrumentation; circumvention of obfuscation and anti-analysis techniques.

Prerequisites: CSC 4103 or equivalent course in operating systems, experience with assembler language is helpful.

Course Coordinator: Prof. Golden G. Richard III; golden@csc.lsu.edu
Office Location: DMC 2020
Office Hours: Spring 2017: M 1:15-2:45, W 10-11:30a or by appt

Learning Objectives:

1. Have a firm understanding of the legal and ethical issues surrounding reverse engineering efforts
2. Understand the primary motivations for reverse engineering
3. Be familiar with the basic architectures of both historical and modern malware
4. Have a deep understanding of static and dynamic analysis techniques commonly employed to reverse engineer and understand malware
5. Thoroughly understand modern anti-analysis techniques and how to circumvent them
6. Be able to independently reverse engineer malware samples using state-of-the-art tools

Reference Text:

Suggested Reading:
Twitter: #dfir, #reverseengineering, #infosec; papers from reverse engineering/malware analysis conferences.

Software:

IDA Pro: https://www.hex-rays.com/products/ida/
Hopper: https://www.hopperapp.com/
**Grading Scheme:**

<table>
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<th>Total Percentage Points:</th>
<th>Final Grading Scale:</th>
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<tbody>
<tr>
<td>Midterm 35%</td>
<td>A+ (98 and above)</td>
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<tr>
<td>Reverse Engineering Assignments 30%</td>
<td>A (94% and above but &lt; 98%)</td>
</tr>
<tr>
<td>Final Exam 35%</td>
<td>A (90% and above but &lt; 94%)</td>
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<tr>
<td></td>
<td>B+ (87% and above but &lt; 90%)</td>
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<td>B (84% and above but &lt; 87%)</td>
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<td>C+ (77% and above but &lt; 79%)</td>
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<td>C (71% and above but &lt; 77%)</td>
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<tr>
<td></td>
<td>C- (68% and above but &lt; 71%)</td>
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<tr>
<td></td>
<td>D+ (65% and above but &lt; 68%)</td>
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<tr>
<td></td>
<td>D (62% and above but &lt; 65%)</td>
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<tr>
<td></td>
<td>D- (58% and above but &lt; 62%)</td>
</tr>
<tr>
<td></td>
<td>F (&lt; 58%)</td>
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</tbody>
</table>

**Assignments:**

This class involves a number of reverse engineering efforts, targeting both historical and modern malware. These assignments involve a combination of static and dynamic analysis strategies, to de-obfuscate and fully document malware samples. Some of the classical malware samples that are provided for analysis include Michelangelo, SQL Slammer, Lucius, and others. Generally students start with a binary malware sample and then perform a full reverse engineering effort, with the end product being a report containing full documentation of the sample's code and data.

**Class Policy:**

- All submitted work for grading is the work of each student, except when teams are explicitly allowed (e.g., for the semester project).
- Due dates are indicated on the assignment.
- Missed deadlines or tests are handled on an individual basis with the approval of the Dean's Office.
- All problems with grading must be resolved within 3 class days of returning the work.
- If class is missed, detailed notes and class content must be acquired from a classmate.

**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 to be online and students are expected to attend class. Absences should be rare and exceptional. Students are expected to have read the assigned chapters or supplementary reading materials prior to class and to participate in class discussions and think critically about the concepts addressed. Students should expect to spend at least six to eight hours outside of class each week reading and doing reverse engineering assignments.

**LSU Student Code of Conduct:**

The LSU Student Code of Conduct explains student rights, excused absences, and what is expected of student behavior. Students are expected to understand this code as described here:

[http://students.lsu.edu/saa/students/code](http://students.lsu.edu/saa/students/code)

Any violations of the LSU Student Code will be duly reported to the Dean of Students.

**Disabilities:**

Louisiana State University is committed to providing reasonable accommodations for all persons with disabilities. If you have a disability that may have some impact on your work in this class and for which you may require accommodations, please see a staff member in Disability Services so that such accommodations can be considered. Students that receive accommodation letters, please meet with me to discuss the provisions of those accommodations as soon as possible.
Major Topics and Schedule:

- Week # 1:
  - Introduction to reverse engineering
  - Why is reverse engineering useful?
    - Interoperability
    - Security auditing
    - DRM
    - Analysis of malware
  - Legal Issues
    - Under what circumstances is reverse engineering legal?
    - When isn't reverse engineering legal?
  - Overview of important foundational knowledge
    - Important assembler languages
    - Popular programming languages for malware development
    - Operating systems internals
    - Hardware

- Week # 2:
  - Historical malware
  - MS-DOS malware case studies

- Week # 3
  - Overview of modern malicious software
    - Viruses
    - Worms
    - Trojans
    - Ransomware
    - Botnets

- Week # 4:
  - Polymorphic and metamorphic malware
  - Malware detection
    - Worm fingerprinting / signature generation
    - Behavioral approaches for detection of malware
    - Hardware agents for system integrity checking

- Week # 5:
  - Low level software
    - Compilation toolchains and impacts on reverse engineering
    - Representation of compiled high level language structures in assembler
    - Virtual machines for interpreted high-level languages

- Week # 6:
  - Static and dynamic reverse engineering techniques
    - System monitoring tools
    - System call, filesystem, and registry tracing
    - Debuggers
    - Disassemblers
    - Decompilers

- Week # 7:
  - Worm case study
    - Infection vectors
    - Target selection
    - Propagation
- Week # 8:
  - Executable file formats
    - Portable Executable (PE) format
    - ELF
    - Mach-O

- Week # 9:
  - Encrypted virus case study
    - Infection vector and propagation
    - Obfuscation strategies
    - Unpacking
    - Effects

- Week # 10:
  - Advanced code obfuscation techniques
    - Control flow obfuscation
    - Opaque predicates
    - Arithmetic obfuscation

- Week # 11:
  - Encrypted and packed executables
    - Identifying packed executables
    - Packing strategies
    - Unpacking

- Week # 12:
  - Anti-debugging techniques
    - Debugger detection
    - Strategies for blocking debugger access

- Week # 13:
  - Anti-VM techniques
    - Types of virtualization
    - Detection of virtualization
    - Exploiting runtime differences in physical vs. virtualized hardware

- Week # 14:
  - Memory forensics and reverse engineering
    - Memory acquisition
    - Malware detection using memory forensics
    - Dumping process memory for analysis
REQUEST FOR ADDING, CHANGING, SUSPENDING OR DROPPING AN UNDERGRADUATE CONCENTRATION

Department Division of Computer Science and Engineering
College Engineering
Name of Concentration Computer Science and Second Discipline
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>
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</table>

APPROVALS:

Department Faculty Approval Date Sept 29, 2017
Department Chair’s Signature [Signature] (Date) 10/18/2017
Chair, FS C & C Committee [Signature] (Date) 11/17/2017

College Faculty Approval Date 11/11/17
College Dean’s Signature [Signature] (Date) 11/11/17
Academic Affairs Approval [Signature] (Date) 10/18/17

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>English Composition (6 hrs.)</td>
<td>ENGL 1001 or 1004</td>
<td>3</td>
<td>(X) 1\st \ 8th</td>
</tr>
<tr>
<td></td>
<td>ENGL 2000</td>
<td>3</td>
<td>(1) 2\nd \ 8th</td>
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<td></td>
<td></td>
<td></td>
<td>(3) 7\th \ 8th</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>(X) 4\th \ 8th</td>
</tr>
<tr>
<td>Analytical Reasoning (6 hrs.)</td>
<td>General Education analytical reasoning course (from mathematics department) MATH 1550</td>
<td>3</td>
<td>(X) 1\st \ 5th</td>
</tr>
<tr>
<td>(At least 3 hours credit must be from a MATH course.)</td>
<td>General Education analytical reasoning course MATH 1552</td>
<td>3</td>
<td>(X) 1\st \ 5th</td>
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<td></td>
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<td>(2) 2\nd \ 6th</td>
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<td>(3) 3\rd \ 7th</td>
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<td>(4) 4\th \ 8th</td>
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<tr>
<td>Arts (3 hrs.)</td>
<td>General Education arts course</td>
<td>3</td>
<td>(X) 1\st \ 5th</td>
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<td></td>
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<td>(2) 2\nd \ 6th</td>
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<td>(3) 3\rd \ 7th</td>
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<td></td>
<td>(X) 4\th \ 8th</td>
</tr>
<tr>
<td>Humanities (9 hrs.)</td>
<td>General Education humanities course Restricted: From CMST list</td>
<td>3</td>
<td>(X) 1\st \ 5th</td>
</tr>
<tr>
<td></td>
<td>General Education humanities course Restricted: From ENGL or HNRS list at the 2000-level</td>
<td>3</td>
<td>(X) 1\st \ 5th</td>
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<td></td>
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<td>(2) 2\nd \ 6th</td>
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<td>(3) 3\rd \ 7th</td>
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<td></td>
<td></td>
<td></td>
<td>(X) 4\th \ 8th</td>
</tr>
<tr>
<td>Natural Sciences (9 hrs.)</td>
<td>General Education natural science course (3 cr. hrs.) [Life Science] BIOL 1001 or BIOL 1201</td>
<td>3</td>
<td>(X) 1\st \ 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>General Education natural science course (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 GEOL 1001 or GEOL 1003</td>
<td>6</td>
<td>(X) 1\st \ 5th</td>
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<td>(2) 2\nd \ 6th</td>
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<td>(3) 3\rd \ 7th</td>
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<td>(X) 4\th \ 8th</td>
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<td>(3 cr. hrs.) A second science course must be selected to complete the sequence in either the BIOL science or physical science.</td>
</tr>
<tr>
<td>Social Sciences (6 hrs.)</td>
<td>General Education social science course</td>
<td>3</td>
<td>(X) 1\st \ 5th</td>
</tr>
<tr>
<td>(At least three hours at the 2000-level.)</td>
<td>General Education social science course (2000-level)</td>
<td>3</td>
<td>(X) 1\st \ 5th</td>
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<td>(2) 2\nd \ 6th</td>
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<td>(3) 3\rd \ 7th</td>
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<td>(X) 4\th \ 8th</td>
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</tbody>
</table>
PROPOSED CHANGES – Computer Science (CS) & Second Discipline 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 in the concentration 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: CS & 2nd Discipline** To elevate a required CSC 3000-level or above elective requirement to a CSC 4000-level.

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 A3ET 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.
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.

The other three CS concentrations require at least two CSC 4000-level electives (6 cr. hrs.) as part of the required CSC concentration area coursework. Instead, the 2nd Discipline concentration requires one CSC 3000-level and above and one CSC 4000-level and above. The course offerings of CSC 3000-level coursework are limited to only independent research courses (CSC 3991, 3992, 3999), and therefore the great majority of the majors in the 2nd Discipline concentration do enroll in a CSC 4000-level course to fulfill the requirement. Explicitly requiring a CSC 4000-level will be consistent with the other concentrations. Students pursuing independent research may apply credits to the tech elective requirements also (6 cr. hrs).

<table>
<thead>
<tr>
<th>CURRENT</th>
<th>Concentration: Second Discipline (9 cr. hrs. CSC)</th>
<th>CSC 2++, 3++, 4+++</th>
</tr>
</thead>
<tbody>
<tr>
<td>PROPOSED</td>
<td>Concentration: Second Discipline (9 cr. hrs. CSC)</td>
<td>CSC 2++, *4++, 4+++</td>
</tr>
</tbody>
</table>

\*Proposed 2018-2019 change to the SEG concentration

**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] Select from BIOL 1001 or 1201 or HNRS 1007</td>
</tr>
<tr>
<td>MATH 1550 (5)</td>
<td>-or-</td>
<td>(3 cr. hrs.) [Physical Science] Select from PHYS 1201 or 201, or CHEM 1001 or CHEM 1201 or CHEM 1421 or ASTR 1101 or GEOL1001 or GEL 1003</td>
</tr>
<tr>
<td>MATH 1552 (4)</td>
<td>BIOL 1201 and 1202 (6)</td>
<td></td>
</tr>
<tr>
<td>MATH 2090 (4)</td>
<td>Physical Science sequence (6) 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>IE 3302 (3)</td>
<td>2 cr. hrs. of science lab with either sequence chosen above</td>
<td>(2 cr. hrs.) Science laboratory are selected to accompany the sequence 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</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>(3 hr. lecture; 3 hr. lab)</td>
<td></td>
</tr>
<tr>
<td>CSC 1351</td>
<td>Computer Science II for Majors</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>(3 hr. lecture; 3 hr. lab)</td>
<td></td>
</tr>
<tr>
<td><strong>CSC 2+++</strong></td>
<td><strong>CSC 2000-level or above elective</strong></td>
<td><strong>3</strong></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>CSC 4103</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><strong>Total CSC cr. hrs. (excluding CSC 2259)</strong></td>
<td><strong>36</strong></td>
<td></td>
</tr>
</tbody>
</table>

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

**CSC 2+++**, "**4+++**", 4+++  
*Proposed 2018-2019 change to the SEG concentration*

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSC 2610</td>
<td>4402, 4501, 4601</td>
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</tr>
</tbody>
</table>

9 + 36 = 45

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

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit Hours</th>
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</thead>
<tbody>
<tr>
<td>CSC 2730, 4402, 4740,&quot;<strong>4+++</strong>&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Proposed 2018-2019 change to the DSA concentration</em></td>
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</tr>
</tbody>
</table>

12 + 36 = 48

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

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSC 2+++</td>
<td>4351, 4402, &quot;<strong>4+++</strong>&quot;</td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Proposed 2018-2019 change to the SEG concentration</em></td>
<td></td>
</tr>
</tbody>
</table>

12 + 36 = 48

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

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSC 2+++</td>
<td>4351, 4402, &quot;<strong>4+++</strong>&quot;</td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Proposed 2018-2019 change to the SEG concentration</em></td>
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</tbody>
</table>

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-, 81-90 B+/B/B-, 71-80 C+/C/C-, 61-70 D+/D/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>
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<tr>
<td>5</td>
<td>Machine Programs: Basics</td>
<td>Chap. 3.1-3.4</td>
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<td>Machine Programs: Arithmetic</td>
<td>Chap. 3.5</td>
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<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>
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<tr>
<td>8</td>
<td>Review and Midterm</td>
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<tr>
<td>9</td>
<td>Machine Programs: Arrays</td>
<td>Chap. 3.8</td>
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<td>Machine Programs: Structures</td>
<td>Chap. 3.9</td>
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<td>10</td>
<td>Storage Technologies</td>
<td>Chap. 6.1</td>
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<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></td>
</tr>
<tr>
<td></td>
<td>Instruction Set</td>
<td>Chap. 4.1-4.3</td>
</tr>
<tr>
<td></td>
<td>Architecture</td>
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<tr>
<td>13</td>
<td>Sequential Implementation &amp; Pipelining</td>
<td>Chap. 4.3-4.4</td>
</tr>
<tr>
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<td>Pipelined Implementation</td>
<td>Chap. 4.5</td>
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<tr>
<td>14</td>
<td>Review</td>
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<tr>
<td>15</td>
<td>Final Exam</td>
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</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:
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.

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
Computer Science and Second Discipline Concentration

CURRENT
Critical path 2017-2018
Computer Science & Second Discipline

CRITICAL REQUIREMENTS

SEMESTER 1: **MATH 1021.**

SEMESTER 2: “C” or better in **ENGL 1001.**

SEMESTER 3 “C” or better in MATH 1550/1551.

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
Computer Science & Second Discipline

CRITICAL REQUIREMENTS

SEMESTER 1: **MATH 1021.**

SEMESTER 2: “C” or better in **ENGL 1001.**

SEMESTER 3 “C” or better in MATH 1550/1551.

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)
- 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**
---

**Semester 4**

- **CRITICAL:** “C” or better in CSC 2259.

- **CSC 2262 Numerical Methods (3)**
- **CSC 3380 Object Oriented Design (3)**
- **CSC 3501 Computer Organization and Design (3)**
- **ENGL 2000 English Composition (3)**
- General Education course - Natural Sciences (3)\(^4\)
- General Education course - Natural Sciences Lab (1)\(^4\)

*Total Semester Hours: 16*

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**Semester 5**

- **CRITICAL:** MATH 2090

- **CSC 4330 Software Systems Development (3)**
- **IE 3302 Engineering Statistics (3)**\(^4\)
- Approved Technical Elective (3)\(^3\)
- CSC (2000-level or above) Elective (3)
- Approved Area Elective (3)\(^2\)

*Total Semester Hours: 15*

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**Semester 4**

- **CRITICAL:** “C” or better in CSC 2259.

- **CSC 2262 Numerical Methods (3)**
- **CSC 3380 Object Oriented Design (3)**
- **CSC 3501 Computer Organization and Design (3)\(^4\)**
- **ENGL 2000 English Composition (3)**
- General Education course - Humanities (Communication Studies course) (3)

*Total Semester Hours: 15*

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**Semester 5**

- **CRITICAL:** MATH 2090

- **CSC 4330 Software Systems Development (3)**
- **IE 3302 Engineering Statistics (3)**\(^4\)
- Approved Technical Elective (3)\(^3\)
- CSC (2000-level or above) Elective (3)
- Approved Area Elective (3)\(^2\)

*Total Semester Hours: 15*
<table>
<thead>
<tr>
<th>Semester 6</th>
<th>Semester 6</th>
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</table>
| - **CSC 4103 Operating Systems (3)**  
- CSC (3000-level or above) Elective (3)  
- Approved Area Elective (3) \(^2\)  
- General Education course - Social Sciences (3)  
- Approved Technical Elective (3) \(^3\) | - **CSC 4103 Operating Systems (3)**  
- CSC (2000-level or above) Elective (3)  
- Approved Area Elective (3) \(^2\)  
- General Education course - Social Sciences (3)  
- Approved Technical Elective (3) \(^3\) |
| **Total Semester Hours: 15** | **Total Semester Hours: 15** |
| Semester 7 | Semester 7 |
| - CSC 3200 Ethics in Computing (1)  
- **CSC 4101 Programming Languages (3)**  
- CSC (4000-level) Elective (3)  
- Approved Area Electives (6) \(^2\) | - CSC 3200 Ethics in Computing (1)  
- **CSC 4101 Programming Languages (3)**  
- CSC (4000-level) Elective (3)  
- Approved Area Electives (6) \(^2\) |
| **Total Semester Hours: 13** | **Total Semester Hours: 13** |
| Semester 8 | Semester 8 |
| - CSC (3000-level or above) Elective (3)  
- Approved Area Elective (3) \(^2\)  
- General Education course - Arts (3)  
- General Education course - Social Sciences (2000-Level) (3) | - CSC (3000-level or above) Elective (3)  
- **CSC (4000-level or above) Elective (3)**  
- Approved Area Elective (3) \(^2\)  
- General Education course - Arts (3)  
- General Education course - Social Sciences (2000-Level) (3) |
| **Total Semester Hours: 15** | **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: See Computer Science advisor. In addition to three credit hours each from a CSC 2000 level or above elective, a CSC 3000 level class or above, and a CSC senior elective, an approved second discipline concentration consists of 15 semester hours of electives in one area outside of the Department of Computer Science. All courses must be taken from a single department except when a university minor is obtained. Courses in the second area are to form a coherent sequence; where possible students should take courses required of a major in that department. Ordinarily, there should be at least two courses numbered 3000 or above. Courses chosen from Information Systems and Decision Sciences must be numbered ISDS 3100 or above. The approval form must be submitted no later than the sophomore year with the consent of the departmental advisor and the dean's office.

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, (3 cr. hrs.) [Life 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 AREA ELECTIVES: See Computer Science advisor. An approved second discipline concentration consists of 15 semester hours of electives in one area outside of the Department of Computer Science. All courses must be taken from a single department except when a university minor is obtained. Courses in the second area are to form a coherent sequence; where possible students should take courses required of a major in that department. Ordinarily, there should be at least two courses numbered 3000 or above. Courses chosen from Information Systems and Decision Sciences must be numbered ISDS 3100 or above. The approval form must be submitted no later than the sophomore year with the consent of the departmental advisor and the dean's office.
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, EVVEG, IE, ME, PETE, EMS, ENVS, 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 3150** 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, EVVEG, IE, ME, PETE, EMS, ENVS, OCS, MATH, ECON, FIN, ASTR, BIOL, CHEM, GEOG, GEOL, PHYS, **ISDS 3100, ISDS 3105, ISDS 3107, ISDS 3120, ISDS 4+++**.

**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. 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.
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: Cloud Computing and Networking
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>
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<td>Total semester hours in current concentration:</td>
<td>120</td>
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<tr>
<td>Total semester hours in proposed concentration:</td>
<td>120</td>
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APPROVALS:

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

College Faculty Approval Date: 11/1/17
College Dean’s Signature: [Signature]
College Dean’s Signature Date: 11/11/17

Chair, FS C & C Committee: [Signature]
Chair, FS C & C Committee Date: 11/30/17

Academic Affairs Approval: [Signature]
Academic Affairs Approval Date: 12/18/17

College/Division/Department Contact: Coretta Douglas
Contact E-mail: douglas@csc.lsu.edu
FORM E ADDENDUM

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>
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<td>English Composition (6 hrs.)</td>
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<td>(At least 3 hours credit must be from a MATH course.)</td>
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<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>
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<td>(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</td>
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<td>(At least three hours at the 2000-level.)</td>
<td></td>
<td></td>
<td>(X) 2&lt;sup&gt;nd&lt;/sup&gt; (6&lt;sup&gt;th&lt;/sup&gt;)</td>
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<td></td>
<td></td>
<td></td>
<td>(X) 3&lt;sup&gt;rd&lt;/sup&gt; (7&lt;sup&gt;th&lt;/sup&gt;)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(X) 4&lt;sup&gt;th&lt;/sup&gt; (8&lt;sup&gt;th&lt;/sup&gt;)</td>
</tr>
</tbody>
</table>
PROPOSED CHANGES – Cloud Computing & Networking (CCN) 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 in the concentration 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

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.
## 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><strong>Current Science Requirements</strong></th>
<th><strong>Proposed Science Requirements</strong></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></td>
</tr>
<tr>
<td>MATH 2090 (4)</td>
<td>Physical Science sequence (6)</td>
<td></td>
</tr>
<tr>
<td>IE 3302 (3)</td>
<td>From PHYS, CHEM, ASTR or GEOL</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 cr. hrs. of science lab with either sequence chosen above</td>
<td>(3 cr. hrs.) [Physical Science] 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></td>
<td></td>
<td>(2 cr. hrs.) A second course must be selected to complete the sequence in either the life science or physical science</td>
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</table>

**PROPOSED: REQUIRED ALL CONCENTRATIONS**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit Hours</th>
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<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 (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><strong>CSC 3+++</strong></td>
<td><strong>CSC 3000-level or above elective</strong></td>
<td><strong>3</strong> Proposed</td>
</tr>
<tr>
<td>CSC 4101</td>
<td>Programming Languages</td>
<td>3</td>
</tr>
<tr>
<td>CSC 4103</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><strong>Total CSC cr. hrs. (excluding CSC 2259)</strong></td>
<td><strong>36</strong></td>
<td></td>
</tr>
</tbody>
</table>

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 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>
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<tr>
<td>4</td>
<td>Floating Point</td>
<td>Chap. 2.4</td>
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<td>5</td>
<td>Machine Programs: Basics</td>
<td>Chap. 3.1-3.4</td>
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<td>Machine Programs: Arithmetic</td>
<td>Chap. 3.5</td>
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<tr>
<td>6</td>
<td>Machine Programs: Control</td>
<td>Chap. 3.6</td>
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<tr>
<td>7</td>
<td>Machine Programs: Procedures</td>
<td>Chap. 3.7</td>
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<tr>
<td>8</td>
<td>Review and Midterm</td>
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<tr>
<td>9</td>
<td>Machine Programs: Arrays</td>
<td>Chap. 3.8</td>
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<td>Machine Programs: Structures</td>
<td>Chap. 3.9</td>
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<tr>
<td>10</td>
<td>Storage Technologies</td>
<td>Chap. 6.1</td>
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<td></td>
<td>The Memory Hierarchy</td>
<td>Chap. 6.2-6.4</td>
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<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>
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<td>Instruction Set</td>
<td>Chap. 4.1-4.3</td>
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<tr>
<td></td>
<td>Architecture</td>
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<tr>
<td>13</td>
<td>Sequential Implementation</td>
<td>Chap. 4.3-4.4</td>
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<td>&amp; Pipelining</td>
<td>Chap. 4.5</td>
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<tr>
<td></td>
<td>Pipelined Implementation</td>
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<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.
   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.
CURRENT

Critical Path 2017-2018

Cloud Computing and Networking

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 2018-2018

Cloud Computing and Networking (CCN)

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)
- General Education course - Humanities (English/Honors 2000-level) (3)
- General Education course - Humanities (Communication Studies course) (3)

Total Semester Hours: 47

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

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 - Natural Sciences Lab (1)**
- General Education course - Humanities (English/Honors 2000-level) (3)

Total Semester Hours: 15

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
Semester 4

- CRITICAL: “C” or better in CSC 2259.
  - CSC 2262 Numerical Methods (3)
  - CSC 2610 Cloud Fundamentals and Web Programming (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 4501 Computer Networks (3)
  - CSC 4601 Cloud Systems and Virtualization (3)
  - IE 3302 Engineering Statistics (3)
  - Approved Technical Electives (3)

Total Semester Hours: 15

Semester 4

- CRITICAL: “C” or better in CSC 2259.
  - CSC 2262 Numerical Methods (3)
  - CSC 2610 Cloud Fundamentals and Web Programming (3)
  - CSC 4103 Operating Systems (3)
  - ENGL 2000 English Composition (3)
  - General Education course - Humanities (Communication Studies course) (3)

Total Semester Hours: 15

Semester 5

- CRITICAL: MATH 2090
  - CSC 4402 Database Systems (3)
  - CSC 4501 Computer Networks (3)
  - CSC 4601 Cloud Systems and Virtualization (3)
  - IE 3302 Engineering Statistics (3)
  - Approved Technical Electives (3)

Total Semester Hours: 15
Semester 6

- **CSC 3380 Object Oriented Design (3)**
- CSC 3501 Computer Organization and 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)
- General Education course - Social Sciences (2000-level) (3)

**Total Semester Hours: 13**

Semester 8

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

**Total Semester Hours: 12**

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 (6 hours required): No more than two elective courses from the same department: CSC 4444, CSC 4512, CSC 4585; EE 4625, EE 4660; IE 4426; ISDS 4120, ISDS 4123; MATH 3355, MATH 4023, MATH 4025, MATH 4171, MATH 4172, MATH 4325; other electives subject to approval.

3. The selection of the CSC (3000-level or above) elective is not restrictive to topics related to Cloud Computing and Networking.

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, ENVS, 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 4559, ART 4560, ART 4466, ART 4468, ART 4480, ART 4482, ART 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 2255 or EE 3180 or EXST 4950 for IE 3302.

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 CCN AREA ELECTIVES (6 hours required): No more than two elective courses from the same department: CSC 4444, CSC 4512, CSC 4585; EE 4625, EE 4660; IE 4426; ISDS 4120, ISDS 4123; MATH 3355, MATH 4023, MATH 4025, MATH 4171, MATH 4172, MATH 4325; other electives subject to approval.

3. The selection of the CSC 2000-level or above elective (3 cr. hrs.) and the CSC 3000-level or above elective (3 cr. hrs.) is not restrictive to topics related to Cloud Computing and Networking.

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, ENVS, 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 4559, ART 4560, ART 4466, ART 4468, ART 4480, ART 4482, ART 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 3150 or EXST 4050 for IE 3302.
ECE approves of this substantiation.

John Scalzo, MSEE
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-----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