NEW COURSE
GENERAL EDUCATION

Proposal for a New Course, General Education

Department ___ Mathematics and Computer Science

Date__ December 1, 2007

__X_ Original Submission ____ Resubmission Date of Original Submission_______
Date of Implementation____________
Retroactive? (If yes, please specify)____

I. New Proposed Course Information

Discipline Prefix CMSC Course Number 121

Course Title Introduction to Computer Science Credit Hours 3

Prerequisite Course ____

Speaking Intensive ______________________ Writing Intensive _______________

If Cross-Listed:

Secondary Prefix ____________________ Course Number ________________

Course Description

An introduction to computer science for the nonspecialist. Basic computer architecture and design, storage formats, principles of computer operation, and algorithms. No prerequisite. 3 credits.

General Education Goal(s) for which course is designed: Goal 5

Please attach a proposed syllabus in SACS format. The syllabus, or an attachment, should indicate in some detail how the course will satisfy each of the nine (9) required General Education Course Criteria (page17).

II. Required for a Major, Minor, Concentration (please specify): None

III. Rationale for Course:

While it may seem somewhat novel to propose that a computer science course be allowed to satisfy Goal 5, quantitative reasoning is a body of skills that is not exclusive to traditional mathematics courses. The discipline of computer science has its roots in mathematics, and many of its fundamental concepts are mathematical in nature. This course focuses on five such concepts: Decisions, looping, and recursion; the binary, decimal, and hexadecimal number systems; storage and transmission of data; digital logic and Boolean algebra; and error correction and detection. We prefer depth to breadth.

To appreciate these concepts, students need to understand a lot of mathematics, and we teach a good deal of math in the course. Perhaps as important, students learn how to use quantitative reasoning skills. They use mathematical models, and they experience the limitations of such models. They discuss the appropriate use of technology to investigate theoretical quantitative concepts.

The course currently is in the catalog and is used by some students to satisfy the additional B.S. degree requirement in math or computer science. Making it a general education course would allow more students to take it and would provide an alternative way for students to satisfy Goal 5.

IV. Resource Assessment

A. How frequently do you anticipate offering this course?

Each semester

B. Describe anticipated staffing for the course, including any changes in existing faculty assignments:

Course will be taught by existing faculty

C. Estimate the cost of required new equipment:

None

D. Estimated cost of and description of additional library resources:

None

E. Will this course require additional computer use, hardware or software? If so, please describe and estimate cost:

No extra resources required.

V. Approvals

	Date Rec’d	Signature Date	Approved
1. Department Curriculum Committee Chair	__________	_______________	_____________
2. Department Chair	__________	_______________	_____________

The Department Chairs, whose programs may be affected, have been notified:

Department __________________ Date Notified ____________

Department __________________ Date Notified ____________

Department __________________ Date Notified ____________

	Date Rec’d	Signature Date	Approved
3. College Dean	__________	_______________	_____________
4. College Curriculum Committee	__________	_______________	_____________
5. General Education Committee	__________	_______________	_____________
6. Educational Policy Committee	__________	_______________	_____________
7. Faculty Senate Chair	__________	_______________	_____________

8. Date received by Registrar __________

Proposals must be submitted early enough to reach EPC by March 1 in order to be included in next year’s catalog.

GENERAL EDUCATION COMPONENT MATRIX (GOAL 5)

Required Outcomes for this Goal	Relevant Course/Institutional Components (refer specifically to course syllabus)	Specific Assessment Method for Outcome
1. Understand how mathematical and/or statistical models can be used to study real world situations.	Weeks 9-12: Boolean algebra (Course objectives 4,5) Weeks 13, 14: Error detection and correction (Course objective 7)	Common exam questions. **Tracking and reporting:** Report the number of students who got problems totally correct, partially correct, and incorrect.
2. Understand the limitations of and assumptions behind typical mathematical models.	Week 4: Units used in computers Weeks 5,6: Decimal, binary, and hexadecimal number systems Weeks 7,8: Data storage and compression (Course objectives 2,3,6)	Common exam questions. **Tracking and reporting:** Report the number of students who got problems totally correct, partially correct, and incorrect.
3. Use mathematical and statistical analysis to interpret such models by testing hypotheses, making predictions, drawing conclusions, checking results for plausibility, and finding optimal results.	Week 4: Units used in computers Weeks 7,8: Data storage and compression Week 7: Magnitude and precision (Course objectives 2,3,6)	Common exam questions. **Tracking and reporting:** Report the number of students who got problems totally correct, partially correct, and incorrect.
4. Understand when technology might be helpful in mathematical or statistical analysis and apply technology when appropriate	Weeks 1-3: Decisions and looping Weeks 13-15: Error detection and correction (Course objectives 1,7)	Common exam questions. **Tracking and reporting:** Report the number of students who got problems totally correct, partially correct, and incorrect.

More details about how the course meets the outcomes are on the next two pages.

DETAILS ABOUT HOW CMSC 121 MEETS GOAL 5 OUTCOMES

Goal 1: ***Understand how mathematical and/or statistical models can be used to study real world situations.***

Relevant course components: Weeks 9 through 12 introduce students to Boolean algebra. Boolean algebra is an abstract set of rules and properties that models systems such as symbolic logic, set theory, and electrical circuits. Students are shown how such apparently disparate systems share common properties. As a specific application, they are taught how the abstract properties and rules can be used to simplify electrical circuits, such as those found in modern computers. Weeks 13 and 14 show how error detection and correction methods use mathematical methods to automatically detect and correct errors that arise in the storage and transmission of data.

Goal 2: ***Understand the limitations of and assumptions behind typical mathematical models.***

Relevant course components: Weeks 4 through 8 introduce students to data storage methods used in computers and how computers perform arithmetic operations. Students learn how binary and hexadecimal numbers are used to represent data, and they learn how subtraction and division can be done by adding complements. They explore the limits on magnitude (how large a number can be stored) and precision (how many digits of a calculated or displayed number are accurate) inherent in modern computers and what happens when those limits are exceeded. Students explore some data compression schemes used to reduce the size of data files, and they investigate the tradeoffs in such methods between reduced file size and loss of data. They learn how to calculate the space required to store data and the time required to transmit data. These calculations are numerically and algebraically intense.

Goal 3: ***Use mathematical and statistical analysis to interpret such models by testing hypotheses, making predictions, drawing conclusions, checking results for plausibility, and finding optimal results.***

Relevant course components: Week 4 introduces students to the basic units used to measure speed and storage capacity in computer systems. Weeks 7 and 8 require students to estimate the spaced required to store text, music, and video data, and then to check these estimates by calculating the actual space needed. Similarly, they have to estimate and calculate the time required to transmit files of various sizes over various media and then to think about whether the times required are acceptable in the real world. Week 7 requires students to examine the tradeoffs between magnitude and precision.

Goal 4: ***Understand when technology might be helpful in mathematical or statistical analysis and apply technology when appropriate.***

Relevant course components: Weeks 1 – 3 introduce students to the basic mathematical operations of decisions and looping and how they can be implemented using common software, such as spreadsheets. Students learn how to implement recursively-defined functions. They apply these techniques to such real world applications as grade books and amortization tables. Weeks 13 – 15 introduce students to error detection and correction, techniques that attempt to detect errors that creep into transmitted data and, if detected, correct those errors automatically. They learn the capabilities and limitations of some of the standard techniques and when it is appropriate to employ them.

General Education Criteria	Relevant Course Components (refer specifically to course syllabus)
1. Teach a disciplinary mode of inquiry (e.g., literary analysis, statistical analysis, historical interpretation, philosophical reasoning, aesthetic judgment, the scientific method) and provide students with practice in applying their disciplinary mode of inquiry, critical thinking, or problem solving strategies.	Weeks 1-3: How to implement theoretical mathematical operations using technology. Weeks 9-12: How Boolean algebra models disparate systems and can be used to simplify complex circuits.
2. Provide examples of how disciplinary knowledge changes through creative applications of the chosen mode of inquiry.	Weeks 4,8: How our ability to handle large amounts of data has changed as we have invented new methods of storing and transmitting data. Week 7: How storage methods affect the magnitude and precision of data.
3. Consider questions of ethical values.	Week 7: Is it reasonable for us to depend on the magnitude and accuracy of computer generated results? Weeks 13-14: Algorithms that can allow machines to detect and correct data errors.
4. Explore past, current, and future implications (e.g., social, political, economic, psychological or philosophical) of disciplinary knowledge.	Weeks 1-3: How technology allows us to investigate problems that used to be considered computationally infeasible. Weeks 13-14: How mathematics can help detect and correct transmission errors.
5. Encourage consideration of course content from diverse perspectives.	Different learning styles are accommodated by encouraging students to approach problems graphically, numerically, and algebraically throughout the course.
6. Provide opportunities for students to increase information literacy through contemporary techniques of gathering, manipulating, and analyzing information and data.	Weeks 1-3: How to solve problems that require decision making and looping using technology. Weeks 4-8: How data is stored in computers.

7. Require at least one substantive written paper, oral report, or course journal and also require students to articulate information or ideas in their own words on tests and exams.	Week 15: A paper relating a topic in the course to a real world situation. Free response test and exam questions.
8. Foster awareness of the common elements among disciplines and the interconnectedness of disciplines.	Weeks 1-3: How mathematics can be done using computers. Weeks 9-12: How Boolean algebra relates symbolic logic, set theory, and electrical circuit design.
9. Provide a rationale as to why knowledge of this discipline is important to the development of an educated citizen.	Weeks 1-3: How computers can help solve real world problems. Weeks 7, 8, 13, 14: The limits on the correctness, magnitude, and accuracy of numerical data obtained from a computer.

CMSC121: Introduction to Computer Science

Syllabus

Instructor: Dr. R. P. Webber

Office location and hours: Ruffner 332. MWF 10 – 10:50, TR 1:10 - 2, and by appointment or coincidence.

Telephone: 395-2192

Email: webberrp@longwood.edu

Course description and prerequisite: An introduction to computer science for the nonspecialist. Basic computer architecture and design, storage formats, principles of computer operation, and algorithms. No prerequisite. 3 credits.

Text: There is no textbook to buy for this course. Instead, reading material and assignments will be posted on Blackboard. **[Note: This material is posted in Blackboard as (CMSC121 200810) General Education Proposal. Look in Course Documents. Currently, all Longwood faculty are authorized to access this site from Blackboard.]**

Course objectives:

1. Understand the fundamental constructs used in programming, including decisions and recursion.
2. Understand how data is stored inside a computer.
3. Be able to convert numbers between the decimal, hexadecimal, and binary systems.
4. Be able to carry out logical and Boolean operations.
5. Know the basics of digital logic circuit design.
6. Be able to calculate the compression ratio for a standard data compression algorithm.
7. Be able to use error correcting algorithms.

Course requirements and grading:

Three tests and a composite group grade (drop lowest of those 4)	42%
Assignments	27%
Project	12%
Final exam	19%

The grade scale is as follows. 90-100 A; 80-90 B; 70-80 C; 60-70 D; below 60 F

Group grade: Often you will be asked to work in groups in class. Working in small groups of three or four, you will be asked to solve a problem and present your results to the class. Each group will receive a grade on that day's work. Each member of the group will receive the same grade, except a member who is absent, who will receive a grade of 0. Missed class participation sessions cannot be made up, but you will be allowed one absence from a class participation session without penalty. All remaining group grades will be counted equally to determine your composite group grade.

Assignments and working with others: It is OK to work with others on homework assignments. Everyone should contribute approximately equally to the work. If somebody tries to freeload, don't work with him or her, and tell me if the person persists. Furthermore, everyone is to write up his or her own solutions. I don't want to see duplicate solutions. In general, it's all right to brainstorm about how to do an assignment, but the details of carrying it out are to be done individually.

Each assignment will have a due date. It is due by the start of class on that date. Failure to hand it in on time will result in a penalty of 25% for each class day it is late. No excuses will be accepted for late programs. I'm sorry, but such things as computer failure, sickness, etc., are not excuses! I strongly urge you not to wait until the last minute to do your assignments. No assignment will be accepted after the last day of the term for any reason.

Project: You will write a paper on how a topic that we have discussed in this course relates to a real world experience or situation. An example is a paper discussing how a spreadsheet can be used to maintain a grade book for a class. Specific instructions for your project will be given in class.

Attendance: Attendance is expected at all classes. Makeup tests will be given only with a doctor's or school excuse. Makeup tests are always more difficult than regular tests, regardless of the reason for absence. Homework assignments that are late for any reason, including excused absences, will be penalized 25% per class day late.

Tentative Schedule:

Week 1	Introduction; Order of operations
Week 2	Programming: Loops and decisions
Week 3	Decisions; computer components
Week 4	Units used in a computer; review
Week 5	TEST; Place value, binary, hexadecimal numbers
Week 6	Hexadecimal, ASCII, 2's complement
Week 7	Floating point, magnitude, precision
Week 8	Data compression
Week 9	Truth tables, logical operations, review
Week 10	TEST; Boolean algebra
Week 11	Boolean algebra, canonical forms
Week 12	Karnaugh maps, parity
Week 13	Error correction
Week 14	Error correction; review; TEST
Week 15	Projects
TBA	FINAL EXAM

Honor Code: The teacher subscribes to the Longwood University Honor System, which, among other things, assumes you do not cheat and that you take responsibility to see that others do not. Infractions will be dealt with harshly. A student who is convicted of an Honor Code offense involving this class will receive a course grade of F, in addition to penalties imposed by the Honor Board.