CPS 101 Introduction to Computational Science

Spring 2009
MWF: 1:15 – 2:15 pm (Holmes 207)

Instructor: Wensheng Shen
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Office hour: TR 1:00 (pm) – 3:00 (pm) or by appointment

Prerequisite: Algebra and Pre-calculus

Textbook: No formal textbook. Materials may include class notes and internet resources.

References: Introduction to Computational Science
Authors: Angela B. Shiflet and George W. Shiflet
Publisher: Princeton University Press
ISBN: 0-691-12565-1

The C Programming Language
Authors: Brian Kernighan and Dennis Ritchie
Publisher: Prentice Hall

Description: This course will illustrate the application of computation in our lives via some simple examples. After exposing the student to the underlying computer hardware and software, it will introduce some common mathematical and computational tools that are important to tackle scientific and industrial problems. It will then introduce students to programming languages, namely Fortran or C, which are very common in the scientific community. Students will learn to program using Fortran or C. Homework assignments will be given to students that involve programming. Several real-life problems will be introduced to students. Finally, the course will introduce Interactive Physics and students will have a chance to solve problems using both computer languages and Interactive Physics. There is a great deal of information generated on computational problems over the Internet. Students will be asked to identify resources on the Internet and will be asked to write a short essay on the role of computation in our lives. A group project will be done at the end of the semester.

Objectives: This course is designed as a general introduction to the field of computational science, and it is assumed that students have some prior exposure to algebra and pre-calculus. However, there will be a review and the course will start with an essay introduction to computation, making the connection between real-life problems and the use of computers. Outcomes of a successful completion of this course include: (1) to understand the use of functions (graphs, tables, equations) in our lives, (2) to understand the rate of change and patterns of change, (3) to understand the working mechanism of computers (hardware/software), (4) to understand the roles of computation, modeling and simulations in science discovery, (5) to gain a simplistic view of the science and universe, (6) to write programs using computer languages (Visual C and Fortran), (7) to experience modeling and simulation using computer softwares, such as *Interactive Physics*, (8) to perform numerical integrations using Excel and computer languages (Fortran and C), (9) able to solve real problems using computer languages (Fortran and C) and Interactive Physics.

Topics: This course includes the following topics: (1) an introduction to computers, such as history, hardware, software, and speed; (2) an introduction to applied mathematics, such as functions, rate of change, differential equations, and numerical integration, (3) basic computer programming techniques by Fortran and C, (4) applications of computer software by Interactive Physics, Excel.

Grading: Homework assignments (50%)
Tests (15%)
Midterm (25%)
Final exam (10%)

Average	100 – 90.0	87.0 – 89.9	83.0 – 86.9	80.0 – 82.9	77.0 – 79.9	73.0 – 76.9
Grade	A	A-	B+	B	B-	C+
Average	70.0 – 72.9	67.0 – 69.9	63.0 – 66.9	60.0 – 62.9	57.0 –59.9	<57.0
Grade	C	C-	D+	D	D-	E

Note: extra credits may be given in home and project assignments as well as tests. Final exam may be replaced by a project.

Assignment policy: Homework assignments given in class will be due in two weeks and project assignments given in class will be due in four weeks after they are assigned. Late assignments can be accepted with a penalty at a rate of 10% per day. ***No makeup tests and no incompletes. A missed test will receive 0 points.*** Exceptions to these rules, at instructor's discretion, apply to cases of illness, personal tragedy, or extraordinary circumstances beyond a student's control, if it is documented to instructor's satisfaction. Arrangement for such an exception needs to be discussed with the instructor.

Attendance: Students are expected to attend all classes. Some of the material may not be contained in the textbook. If a student misses a class, it is his/her responsibility to get class notes and handouts. Absences will be excused for documented illness, official representation of the College, an unfortunate death of a close relative, religious holiday, and other circumstances beyond student's control.

Authorship: Students are allowed to discuss ideas and help others by explaining concepts and possible solutions. All the work that is submitted, however, must be performed by individual students independently. Students must provide appropriate citations for any text fragments in books, journals, conference proceedings, web-based resources, etc. that have been used in their assignments. Students also need to acknowledge any help from others. A student is considered cheating if he/she submits materials as his/her own work that is not entirely his/her own work, or if he/she intentionally provides an answer to another person. If cheating has been detected, the student will receive a zero grade for that assignment. Further disciplinary procedures may also be considered.

Disability Statements: Students with documented disabilities may be entitled to specific accommodations. SUNY Brockport's Office for Students with Disabilities makes this determination. Please contact the Office for Students with Disabilities at 395-5409 to inquire about obtaining an official letter to the course instructor detailing approved accommodations. The student is responsible for providing the course instructor with the official letter. Faculty and staff work as a team with the Office for Students with Disabilities to meet the needs of students with disabilities.

Weekly Schedule

Week 1	Jan. 26	Class begin, syllabus, introduction
	Jan. 28	Explanation of survey, Chapter 1: Computer History
	Jan. 30	Chapter 2: Computer Hardware and Software
Week 2	Feb. 2	Chapter 2: Computer Hardware and Software
	Feb. 4	Chapter 3: Memory Hierarchy
	Feb. 6	Chapter 3: Memory Hierarchy
Week 3	Feb. 9	Chapter 3: Memory Hierarchy
	Feb. 11	Chapter 4: How Computers Work
	Feb. 13	Chapter 4: How Computers Work
Week 4	Feb. 16	Chapter 5: How Computers Perform Computations
	Feb. 18	Chapter 5: How Computers Perform Computations
	Feb. 20	Chapter 5: How Computers Perform Computations
Week 5	Feb. 23	**Test1**
	Feb. 25	Chapter 6: Functions
	Feb. 27	Chapter 6: Functions
Week 6	Mar. 2	Chapter 7: Algebra
	Mar. 4	Chapter 7: Algebra
	Mar. 6	Chapter 7: Algebra
Week 7	Mar. 9	Chapter 8: Derivatives
	Mar. 11	Chapter 8: Derivatives
	Mar. 13	**Midterm exam**
Week 8		Spring break
Week 9	Mar. 23	Chapter 9: Computational Tools --- Excel
	Mar. 25	Chapter 9: Computational Tools --- IP
	Mar. 27	Computer lab: Excel
Week 10	Mar. 30	Chapter 9: Computational Tools --- IP
	Apr. 1	Computer lab: Interactive Physics
	Apr. 3	Computer lab: Interactive Physics
Week 11	Apr. 6	Chapter 10: C/Fortran Program Language
	Apr. 8	Chapter 10: C/Fortran Program Language
	Apr. 10	Computer lab: Writing C Program
Week 12	Apr. 13	Chapter 10: C/Fortran Program Language
	Apr. 15	Chapter 10: C/Fortran Program Language
	Apr. 17	Computer lab: Writing C Program
Week 13	Apr. 20	Chapter 10: C/Fortran Program Language
	Apr. 22	Chapter 10: C/Fortran Program Language
	Apr. 24	Computer lab: Writing C Program
Week 14	Apr. 27	**Test**
	Apr. 29	Chapter 10: C/Fortran Program Language
	May 1	Computer lab: Writing C Program
Week 15	May 4	Chapter 10: C/Fortran Program Language
	May 6	Chapter 10: C/Fortran Program Language
	May 8	Computer lab: Writing C Program