Computer Science Syllabus

September 2017 - May 2018, Abelard School

Email

Instructor Information

Instructor

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General Information

Description

This course is intended to be a mix of beginner and intermediate computer science, focusing on how to program efficiently. The programming language that we'll use in this course will be Python 3.6. The last weeks of the course will focus on the cutting edge of computer science - artificial intelligence and machine learning.

Expectations and Goals

The goals for this course are to orient you in the world of computer logic and to be able to tackle a variety of problems efficiently and effectively using the Python programming language.

Of course, the most important goal of all is for you to be challenged and enjoy the course. If you ever feel that you are not challenged enough, please notify the instructor.

Course Materials

Required Materials

A laptop with either Microsoft, Mac/IOS, or Linux as the operating system. If you do not have a laptop, please notify the instructor - Abelard does have rental laptops available.

Other than that, you're set! All of the notes and notebooks that we'll be using in the course, as well as other course material, will either be handed out in class or available on the instructor's website for download.

Grading Scheme

Assignments and projects (semi-weekly)	50%
Mid-year exam	10%
Conversation	10%
Final Project (Due last week of class)	20%
Final Exam	10%

This class will be very hands-on, and I hope that you'll find the evaluations to be straight-forward as a result. We will walk through examples of what is taught during class and have short problem-solving sessions that can be completed in groups. Simply participating and trying these counts as Conversation - not necessarily getting the correct answer.

The weekly assignments, although plentiful, will be short. They are intended to be a near-direct way for you to demonstrate the skills you learned in class that week. Extended projects will take more time, and will typically be given 2 weeks before the deadline. Assignments will be open after class on Tuesday and are due by email submission at 11pm on the following Sunday evening, **projects will be due the the second Sunday by email submission after opening**. If there are any difficulties in completing the assignment or submitting it, please notify the instructor. It is encouraged that you work together - although copying is strictly forbidden.

Your final project will be due the last week of classes in May 2018. It will be comprised of a program that you will create on your own from scratch to solve a given problem and an accompanying report describing your chosen method and accuracy of your program. It is mandatory that you DO NOT WORK TOGETHER ON THE FINAL PROJECT, AS THIS SHOULD BE COMPLETELY YOUR OWN WORK.

Course Schedule

Note that this is the intended schedule, but things may change as we recognize areas that require more or less time than allotted.

Term 1:

Unit A: Computer Science and Technology Part I (4.5 hours)

Overall Expectations: D1, D2, D3

Specific expectations: D1.1 (human health impact), D2.1 (ethical issues), D3.1 (impact of tech around the world)

Assessment:

For: Knowledge of content, understanding of content, use of planning skills, expression and organization of ideas and information, use of conventions

As: Learning goals, self-assessment

Of: Observation (teacher logs), Conversation (in-class group work and discussion), KICA-assessed assignment (1 assignment/report)

Unit B: Basic Programming Structures (15 hours)

Overall Expectations: A1, A3, B1, C1

Specific Expectations: A1.1 (integer division and remainder usage), A1.5 (1D arrays and compound data types), A3.2, A3.3, A3.6 (linear and binary searches in arrays, change, delete, insert elements into arrays, recursive algorithms), B1.1, B1.2, B1.4, B1.5, B1.6 (project management), C1.1, C1.2 (decompose a problems into modules, apply data encapsulation)

Assessment:

For: Knowledge of content, understanding of content, use of planning and processing skills, use of critical and creative thinking, use of conventions, application of knowledge and skills, making connections

As: Learning goals, self-assessment, teacher feedback, peer and self-editing

Of: Observation (teacher logs), Conversation (in-class group work and discussion), KICA-assessed assignments (1 extended project, 2 assignments)

Unit C: Basic Programming Logic and common errors (15 hours)

Overall Expectations: A1, A4, C2

Specific Expectations: A1.2-A1.4 (type conversion, non-numeric comparisons, limitations of finite data representation), A4.1, A4.2 (work independently and as a team to resolve syntax issues, develop and implement formal testing plans), C2.1, C2.4 (recognize pre and post conditions in algorithms, identify common pitfalls)

Assessment:

For: Knowledge of content, understanding of content, use of processing skills, use of critical/creative thinking processes, use of conventions, application of knowledge and skills, making connections, transfer of knowledge

As: Learning goals, self-assessment, teacher feedback, peer and self-editing

Of: Observation (teacher logs), Conversation (in-class group work and discussion), KICA-assessed assignments (5 assignments)

Term 2:

Unit D: Plotting, data representation, and external files (6 hours)

Overall Expectations: A3

Specific Expectations: A3.1 (read/write to file), plotting options, abilities, and preferences

Assessment:

For: Knowledge of content, understanding of content, use of processing skills, use of critical/creative thinking processes, use of conventions, application of knowledge and skills, making connections, transfer of knowledge, expression and organization of ideas and information, communication to different audiences and for different purposes

As: Learning goals, self-assessment, teacher feedback, peer and self-editing

Of: Observation (teacher logs), Conversation (in-class group work and discussion), KICA-assessed assignments (2 assignments)

Unit E: Modularization, Efficiency, and data structures (18 hours)

Overall Expectations: A2, A3, B2, C1, C2

Specific Expectations: A2.1-A2.3 (modules in multiple files, reusable code, modify existing modular code to improve efficiency), A3.4, A3.5 (sort elements in an array, process elements in a 2D array), B2.1-B2.3 (large software project contribution, meeting project goals and deadlines, reflect and assess team and individual input), C1.3, C1.4 (apply functional decomposition in subprogram design, principle of reusability), C2.2, C2.3 (compare efficiency of linear and binary searches, and sorting algorithms)

Assessment:

For: Knowledge of content, understanding of content, use of processing skills, use of critical/creative thinking processes, use of conventions, application of knowledge and skills, making connections, transfer of knowledge, expression and organization of ideas and information, communication to different audiences and for different purposes

As: Learning goals, self-assessment, teacher feedback, peer and self-editing

Of: Observation (teacher logs), Conversation (in-class group work and discussion), KICA-assessed assignments (4 assignments, 1 extended project)

Unit F: Code Maintenance and usage (10.5 hours)

Overall Expectations: A4, B1

Specific Expectations: A4.3, A4.4 (practices for making fully documented code, including clear and maintainable external user documentation), B1.3, B1.7 (produce software user docs and training materials, use shared resources to manage source code)

Assessment:

For: Knowledge of content, understanding of content, use of critical/creative thinking processes, use of conventions, application of knowledge and skills, making connections, communication to different audiences and for different purposes

As: Learning goals, self-assessment, teacher feedback, peer and self-editing

Of: Observation (teacher logs), Conversation (in-class group work and discussion), KICA-assessed assignments (1 assignment, 1 extended project)

Term 3:

Unit G: Malware and how to protect against it (4.5 hours)

Overall Expectations: C2 (ICS3U)

Specific Expectations: C2.2 (safeguard against malware, devise a plan to protect data and code)

Assessment:

For: Knowledge of content, understanding of content, use of processing skills, use of critical/creative thinking processes, use of conventions, application of knowledge and skills, expression and organization of ideas and information, communication to different audiences and for different purposes, use of planning skills

As: Learning goals, self-assessment, teacher feedback, peer and self-editing

Of: Observation (teacher logs), Conversation (in-class group work and discussion), KICA-assessed assignments (1 assignment/report)

Unit H: Computer Science and Technology Part II (Career opportunities and education) (6 hours)

Overall Expectations: D1, D2, D3

Specific expectations: D1.2, D1.3, D1.4 (strategies to reduce impact on environment and human health, identify government agencies/community partners that provide resources and guidance for environmental stewardship), D2.2, D2.3 (ethical code of conduct for programmers and why it's necessary, strategies to encourage ethical conduct at home, school, and work), D3.2 (investigating emerging technology)

Assessment:

For: Knowledge of content, understanding of content, use of planning skills, use of critical/creative thinking processes, making connections, transfer of knowledge, expression and organization of ideas and information, communication to different audiences and for different purposes

As: Learning goals, self-assessment, teacher feedback, peer and self-editing

Of: Observation (teacher logs), Conversation (in-class group work and discussion), KICA-assessed assignments (1 extended project/report)

Unit I: Real-world applications, the field and the workplace (24 hours)

Overall Expectations: D4 (D3 for ICS3U)

Specific expectations: D4.1, .2, .3, .4 (understanding emerging areas of research between computer science and other fields, and essential skills and work habits), focus on student chosen fields, machine learning, career choices and paths

Assessment:

For: Knowledge of content, understanding of content, use of critical/creative thinking processes, use of conventions, application of knowledge and skills, making connections, expression and organization of ideas and information

As: Learning goals, self-assessment, teacher feedback, peer and self-editing

Of: Observation (teacher logs), Conversation (in-class group work and discussion), KICA-assessed assignments (2 extended projects)