CENTER FOR GRADUATE AND PROFESSIONAL STUDIES
GOUCHER COLLEGE
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SYLLABUS

AP 518.100.18SU: Preparing Students for Advanced Placement Computer Science A

This course will provide an overview of the content and structure of the AP Computer Science A curricula. Teachers will focus on object-oriented programming methodology, with emphasis on problem solving and algorithm development. Participants will explore how the development and analysis of standard algorithms and the use of fundamental data structures within the AP Computer Science framework can support their classroom instruction in preparing their students for the AP Computer Science exam. Focus also will be placed on both multiple-choice and free-response aspects of the exam, including the introduction of *Magpie*, *Picture* and *Elevens*, the newest lab components to support hands-on lab experiences. It is advisable that participants be familiar with Java.

Dates and times

This week-long program will run from 8:30am to 4:00pm Monday (6/17) through Thursday (6/20), and from 8:30am to 1:00pm on Friday (6/21).
The lab will be open from 7:00pm – 10:00pm Monday through Thursday evening. We will meet in Julia Rogers (Room 128).

Text Books

If publishers cooperate we will use a variety of textbooks as reference material, including:
✓ Java Software Solutions (Lewis and Loftus) 4th Edition (0-321-24583-0)
✓ Java Concepts (Cay Horstmann) 6th Edition (978-0-470-50947-0)
✓ Barron's AP Computer Science 2013 (Roselyn Teukolsky) 7th Edition (978-1-4380-0594-2)
✓ Be Prepared for the AP Computer Science Exam in Java (Maria and Gary Litvin) 5th Edition (0-9654853-5-8)
✓ Java Methods – Object-Oriented Programming and Data Structures (Maria and Gary Litvin) 3rd Edition (978-0-9824775-6-4)
✓ Other Resources available.

Course Objectives

✓ Develop object-oriented programming methodology consistent with AP curricula
✓ Develop an understanding of the selection of fundamental data structures and algorithms in a problem solving environment
✓ Become conversant with AP grading mechanisms
✓ Develop an understanding of Magpie, Picture and Elevens Labs in respect to their

application as a vehicle of learning for the AP curriculum.

College Board Advanced Placement Teacher Standards

- ✓ Content Knowledge
- ✓ Teacher Certification
- ✓ Pedagogy and Student Learning
- ✓ Analysis and Reflection
- ✓ Ongoing Professional Development

Graduate Programs in Education Outcomes

- ✓ GPE001: Knowledge - Theory: Apply knowledge of psychological and educational theory, research, and/or philosophy related to the area of specialization or certification
- ✓ GPE002: Knowledge - Assessments: Demonstrate understanding and use of the types of assessments appropriate to the area of specialization or certification
- ✓ GPE004: Knowledge - Diversity: Demonstrate knowledge of concepts related to diversity, and the interaction between concepts related to diversity and the area of specialization or certification
- ✓ GPE005: Skills - Theory: Demonstrate the ability to incorporate theory and research into practice related to the area of specialization. GPE006: Skills - Data: Demonstrate the ability to gather appropriate data and use data in problem analysis and decision-making related to the area of specialization
- ✓ GPE007: Skills - Problem Solving: Use problem solving/critical thinking strategies appropriate to the area of specialization
- ✓ GPE008: Skills - Reflection: Use reflective practice within the area of specialization
- ✓ GPE009: Skills - Communication: Demonstrate effective communication and presentation skills related to the area of specialization. GPE010: Skills - Technology: Use a variety of technologies appropriate for working in the area of specialization
- ✓ GPE012: Dispositions - Diversity: Demonstrate positive dispositions toward diversity and equity.

Course Breakdown

Day 1
Session I (8:30am – 10:00am)
- ✓ A Gentle Introduction to Canvas/Google Drive
- ✓ What is a Best Practice?
- ✓ Introductions
- ✓ Magpie Lab
  - o Activity 2 and 3

Break (10:00am – 10:15am)

Session II (10:15am – 12noon)
- ✓ Introduction to Algorithms

- ✓ Input/Output
- ✓ Arithmetic Operators
- ✓ Primitive Data Types
- ✓ Variable Declaration
- ✓ Object Use
- ✓ Math, Random and String Classes
- ✓ if Statements
- ✓ Decision Making
- ✓ while Statements
- ✓ for and for each Statements
- ✓ Strings
- ✓ Assignments
  - o ACSLland – A journey into OOP
  - o Alphabet Distances
  - o Brilliant Numbers
  - o Eleven Rules
  - o Farmer Ryan
  - o Get It Into Gear
  - o Golf (easy/medium)
  - o Multiples
  - o Next Prime
  - o Palindrama
  - o Palindromic Numbers
  - o Pension
  - o Special Words
  - o String Transformations
  - o Wild Character

Lunch (12noon – 1:00pm)

Session III (1:00pm – 2:30pm)
- ✓ Grading the AP Exam
  - o A look at the 2019 Free Response Questions

Break (2:30pm – 2:45pm)

Session IV (2:45pm – 4:00pm)
- ✓ Open Session
  - o Work on various assignments

Day 2

Session I (8:30am – 10:00am)
- ✓ Picture Lab
  - o Activity 1 – 4

Break (10:00am – 10:15am)

Session II (10:15am – 12noon)
- ✓ Class Definitions
- ✓ Encapsulation
- ✓ Method Declarations
- ✓ Method Invocation and Parameter Passing
- ✓ Method Overloading
- ✓ Object Relationships
- ✓ Reference aliases
- ✓ Object References – Passing as Parameters
- ✓ Array Definition (1D Arrays)
- ✓ Passing Arrays as Parameters
- ✓ List Interface
- ✓ ArrayList Class
- ✓ Searching (Sequential and Binary)
- ✓ Sorting (Selection, Insertion and Mergesort)
- ✓ Class Hierarchies
- ✓ Class Relationships
- ✓ Assignments
  - o Self-Adjusting Lists (for us to do)
  - o Bowlarama
  - o Deletions (E/H)
  - o Pick Me
  - o Road Race
  - o Sum of Pairs
  - o Triangles: Getting to the Point

Lunch (12noon – 1:00pm)

Session III (1:00pm – 2:30pm)
- ✓ Elevens Lab
  - o Activities 1-3, 9

Break (2:30pm – 2:45pm)

Session IV (2:45pm – 4:00pm)
- ✓ Coding Self-Adjusting Lists
- ✓ Open Session
  - o Work on various assignments

Day 3

Session I & II (8:00am – 12noon)
- ✓ Field Trip
  - o Bus leaves at 8:00am – More info to come

Lunch (12noon – 1:00pm)

Session III (1:00pm – 2:30pm)
- ✓ Grading the AP Exam
  - o A look at the 2019 Free Response

Break (2:30pm – 2:45pm)

Session IV (2:45pm – 4:00pm)
- ✓ Resources
- ✓ A look at the Major Assignments
- ✓ Best Practice example

- ✓ Open Session
  - o Work on various assignments

Day 4
Session I (8:30am – 10:00am)
- ✓ Group Work Activity
- ✓ Resources (another look)

Break (10:00am – 10:15am)

Session II (10:15am – 12noon)
- ✓ Generic Classes
- ✓ Wrapper, Autoboxing and the enhanced for loop (again)
- ✓ Common Array Algorithms (traversal, insertions, deletions, iterators)
- ✓ Abstract Classes
- ✓ Subclass Design and Modification
- ✓ Recursive methods
- ✓ Appropriate uses of recursion
- ✓ Relationship between recursion and iteration
- ✓ Recursion and efficiency
- ✓ 2D arrays
- ✓ Class iteration, interfaces and inheritance
- ✓ Assignments
  - o Binary Time Method
  - o Hanjie
  - o Mowing
  - o Number Please
  - o Old MacDonald
  - o Pinewood Derby
  - o Scrabble
  - o Summit
  - o Time2 +- Time2
  - o Tumor Detection

Lunch (12noon – 1:00pm)

Session III (1:00pm – 2:30pm)
- ✓ Best Practices

Break (2:30pm – 2:45pm)

Session IV (2:45pm – 4:00pm)
- ✓ Open Session
  - o Work on various assignments

Day 5

Session I (8:30am – 10:00am)
- ✓ Best Practices

Break (10:00am – 10:15am)

Session II (10:15am – 12noon)
- ✓ Organize files for take-home
- ✓ Work on various assignments
- ✓ Final summation

Lunch (12noon – 1:00pm)

Contact Information
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Description of Requirements for Graduate Credit
To receive graduate credit students MUST:
- o Complete a required number of programs consistent with the level of expertise of the student and submit to Canvas no later than 1 week after the last class.
- o Complete a class presentation on "Best Practices"
- o Attend class 100% of the time.