COP 4516: Problem Solving Techniques and Team Dynamics Syllabus

Course Website: http://www.cs.ucf.edu/~dmarino/progcontests/cop4516/spr2020

Lecturer: Arup Guha   **Email:** dmarino@cs.ucf.edu
Class Times/Locations: T 10:30 – 11:20am (HEC-103),
                               F 9:00 – 11:50am (HEC-202, HEC-308)
Office: HEC – 240   **Office Phone Number:** 407-823-1062
Office Hours: TBA (check course website)

I do NOT check my WebCourses email. Please email me at dmarino@cs.ucf.edu to contact me.

This course requires Friday attendance. Please don't plan trips where you leave on Thursday night.

Course Description: This course covers training similar to that given to UCF's programming team. Lectures will cover classical algorithms, most of which are taught in Computer Science 2, that tend to be useful in solving programming contest problems. Emphasis will be placed on implementation issues. The general topics covered are: number theory, brute force search, greedy algorithms, graph algorithms, dynamic programming algorithms and geometry algorithms.

Note: There is NO course textbook. Rather, course notes and websites will be used as primary sources. If one strongly desires a book, here are a few that would suffice:

Introduction to Algorithms – Cormen, Leiserson, Rivest, Stein (ISBN: 978-0-262-03384-8)
Programming Challenges – Skiena, Revilla (ISBN: 0-387-00163-8)
Algorithms – Dasgupta, Papadimitriou, Vazirani (ISBN: 0-07-352349-2)
The Design and Analysis of Algorithms – Levitin (ISBN: 0-321-35828-7)
Competitive Programming 3 - Halim and Halim (cpbook.net)

Grading

This course will have five components

Item	Quantity	Total Percentage
Online Contest Participation	2	10
Written Reflections	2	5
Individual Contests	6	30
Team Contests	6	30
Individual Contest Exam	1	15
Team Contest Exam	1	10

UCF Practice/Online Contest Participation (USACO and/or Codeforces)
There are several online websites that run programming contests. Two of these are: CodeForces, and USACO. I would like for you to run at least two contests outside of class chosen from: **REAL** USACO competitions, **REAL** Codeforces competitions (**not a virtual participation**) or UCF Practices. **To earn credit, you must compete for a minimum of 2 hours.** Before I award the grade to you, you must show me the scoreboard on your laptop during my office hours for one contest **before** March 2, 2020 and for a second contest **before** April 13, 2020 to get credit for this portion of the course grade. The credit I assign for this will be based on both how you perform in the contest. **(Note: for those of you with past contest experience, I may place the bar a bit higher for you to get full credit based on what I know about your performances in past contests. For students who intentionally underperformed in the past, I gave 60% or 80% for this grade.)**

NOTE: PLEASE DO THESE EARLY. IT IS EASY POINTS AND EVERY SEMESTER ABOUT 10 STUDENTS FORGET ABOUT THIS AND BASICALLY LOSE CLOSE TO A LETTER GRADE IN THE COURSE. IF YOU LOOK ONE WEEK BEFORE THE DEADLINE, THERE MAY BE NO CONTESTS!!!

Written Reflections on Contest Performance
We often get better at competitions through self-analysis. After the first six Individual Contests are complete, I'll ask you to write a reflection piece on how you think you performed in those contests (and the extra online contests), focusing on what you did well and what you could improve upon and how you might be able to achieve that improvement. The idea here is to help you prepare for the Individual contest exam, which is a larger portion of the course grade. Then, after the six Team Contests, I'll ask your team to submit a single reflection piece on the team's performance and what improvements/adjustments can be made to maximize performance for the Final Team Contest. Both of these will be due over Webcourses.

Individual Contests
For the first 6 weeks of the course, individual contests will be held on Fridays, each with 4 problems. 100% will be given to any question correctly submitted during the contest. 80% will be given to any question correctly submitted after the contest, before the test data is posted. 60% will be given to any question correctly submitted after the test data is posted but before 10 am of the Wednesday after the contest has completed. 0% is awarded otherwise.

Team Contests

For the second half of the course, each Friday competition will be in teams. Based on how students perform in the first half of the class and other factors, **I WILL ASSIGN TEAMS.** Grading will be determined in the same manner as the individual contests and the same grade will be assigned to each team member, regardless of who solves which questions. **Note: It's rarely the case on a good team that team members split up the work equally. Trying too hard to split up the work equally will likely worsen your team's performance and grade.**

Individual Contest Exam

After the first six weeks of the course, a more comprehensive contest will be given for individuals. The only differences are that no submissions will be allowed after the contest is over, that this contest counts towards 15% of the final grade instead of 5% and all of the questions in this contest will be newly created for the contest itself. There will be four unique questions, each worth 25% of the individual contest exam grade, but some of the unique questions may be split up into two separate submissions on the contest software with different bounds (easy, hard). The reason for this is to allow for some partial credit. For these questions, if you correctly solve all cases for the easy bounds, you'll earn some specified portion of the credit out of the 25% allocated for that problem. Details will be discussed in class.

Team Contest Exam

During the final exam period for the course, the teams will compete in a final contest. No submissions will be allowed after the contest has ended. Grading will occur in a similar manner to the Individual Contest Exam, where some questions will have two sets of bounds to allow for some partial credit.

Method of Awarding Final Grades

Unlike other courses, final grades aren't awarded solely on the basis of the percentage in the course. Since this is a contest class and I have to award grades to individuals, even though a bulk of the grade comes from teamwork, I don't want to award a grade to someone that was largely earned due to the excellence of a teammate. To that end, for each letter grade cut-off, I'll set a minimum number of problems solved ***in the seven individual contests*** in addition to the usual percentage cut-off. In order to earn a letter grade for the course, a student must meet ***BOTH*** cut-offs. Unfortunately, I won't announce these cut-offs until the end of the semester as I feel that doing so would promote some students to produce substandard work. In the past, I've changed my cut-offs for individual contests (made them lower) because I've seen some individuals work extremely hard in the team phase of the class. I would hate to tell a student that the best grade they could earn is a C and then see them slack in the second part of the course. To give you an idea where this cut-off might lie, in the past, it's usually been around 12-15 problems for an A, over the seven individual contests, so an average of close to 2 problems correct per contest should be good enough to earn an A in the course. ***Note: Plus/Minus grades will be awarded when deemed appropriate.***

Policy for Absences from Friday Contests
For individual contests, if you are absent for a significant portion (more than 1 hour) of the contest *without prior approval*, then ***NO PARTIAL CREDIT CAN BE EARNED FOR SOLVING PROBLEMS AFTER THE CONTEST.*** (Naturally, if you solve all of the problems in the contest early, you are immediately free to go! But, if you show up very late or leave very early and leave problems unsolved, then you can't later earn 80%/60% credit on those questions.)

Since many of you are busy (whether it be lining up interviews for potential jobs or working current jobs), if you know in advance that you'll have to miss on a particular Friday for an individual contest, then ***please notify me in advance.*** I will let you make up the grade by running a specified online contest in real time. (***I will give you a short selection of options and you must choose one of them.***) This is in addition to the two online contests you'll have to run during the semester. Based on your performance and the code you show me, I'll assign a grade that I feel is appropriate. I need to leave myself full discretion here due to the differences in difficulty of various contests and the limited availability of online contests during short time frames.

If you need to miss a team contest Friday ***and tell me in advance***, you have two options: (a) If your team agrees, they can pick up your slack and I'll give you the grade they earn for the week without you. (b) I can assign you an additional individual online contest to run.

Academic Misconduct Policy
Since this is an elective (you don't have to be here, so I assume you are here because you WANT to be), I will be more harsh with academic misconduct than usual. ***In particular, if there are any clear violations of the academic misconduct policy, I will make official documentation with the necessary witnesses, record the transgression with UCF and fail you from the course.*** The rules for the course are as follows:

1) During any individual contests, individuals may ONLY look at language APIs online and no other electronic materials. **Students may look at any printed materials.** Students **may not** talk to any other students during the individual contests about any items that I might think may be helpful in solving the problems. I reserve my right to use my discretion on whether or not a topic of conversation may be helpful in solving a problem. You are safe in telling someone where the bathroom is or describing where a restaurant is located, for example. You are NOT safe in explaining the steps of any algorithm or pointing out a restriction in a problem, for example.

2) During team contests, you may only talk to your team members about problem related issues and you may ONLY look at language APIs online and no other electronic materials. **You may look at any printed materials.** Communication with non-team members in the course is limited as previously described.

Tentative Schedule

Week	Tuesday Class	Friday Class
Jan 6	Java API, Brute Force	Ind Contest #1
Jan 13	Java API, Greedy	Ind Contest #2
Jan 20	Java API, Trees	Ind Contest #3
Jan 27	Tries	Ind Contest #4
Feb 3	Graph – DFS, BFS	Ind Contest #5
Feb 10	Shortest Distance, Top Sort	Ind Contest #6
Feb 17	Team Dynamics/Exam Review	Class Cancelled
Feb 24	Cumulative Sums, Mathematics	Ind Contest Exam
Mar 2	Graph – Network Flow	Team Contest #1
Mar 9	**Spring**	**Break!!!**
Mar 16	Guest Lecture - Take it or leave it DPs (Knapsack, LCS, Neighbor)	Team Contest #2
Mar 23	DP – Edit Distance, MCM, World Series	Team Contest #3
Mar 30	2D Geometry	Team Contest #4
Apr 6	3D Geometry	Team Contest #5
Apr 13	Binary Search Applications	Team Contest #6
Apr 20	**Team Contest Exam (10 am – 1 pm)**	**NO CLASS**

I may change this schedule, thus class attendance is important. This is a general time frame only and is subject to the needs of the class. At the end of each class I will tell you what we will be discussing during the next class period. I may not post formal notes from the lectures, so please take all necessary notes during lectures. Good notes for most of the topics I will cover can be found online. I will make whatever notes to which I have access available online for students.