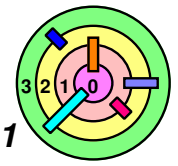
CS 402
Operating Systems

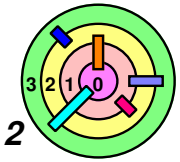
Bill Cheng

http://merlot.usc.edu/william/usc/



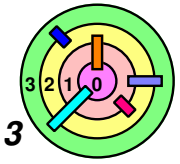
Fact Or Myth?

- Is it true that doing well in this class gets you job offers?



Fact Or Myth?

- Is it true that doing well in this class gets you job offers?
  - definitely true!
    - if you *learn the course material* well, and
    - if you implemented all the assignments *yourself* and without looking at other people's code)
    - if you *participate* in the class Google Group discussions, especially to help out other students
- Whatever you can find on the Internet, everyone else can find it
  - you cannot distinguish yourself by just reading
  - if you want to impress your interviewers, you need to impress them with your *experience (integrated with your knowledge)*
    - the "theory" stuff is just as important as "kernel hacking" and this is *not* a programming / kernel hacking class



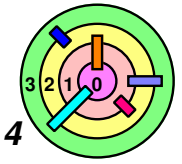
My Teaching Style

- I'm a strong believer in: (adapted from Lao Tzu)

  Give a man a fish and you feed him for a day.
  Teach a man to fish and you feed him for a lifetime.

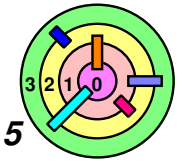
  - except for the warmup programming assignments, I tend not to give a straight answer
    - I want you to find the answers yourself (together with your peers) and will teach you how to do that
    - I will help by pointing you in the right direction
      - so, you should feel free to *ask me questions*

- Recipe for success in CS 402
  - I will make quite a few recommendations on what to do and when
    - you are all adults, I cannot tell you what to do
    - you should follow my recommendations!
      - your success is my success!
    - *ask me questions* if there is anything unclear



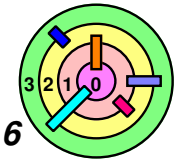
No "Spoon-feeding"

- The coverage of this class is quite vast
  - too many important concepts to cover in 11 weeks
  - you have to *learn some things on your own*
    - CS students often have to learn certain things on their own
    - if you don't know how, I will teach you how to do that
  - it is not feasible for me to explain everything till everyone understands them perfectly before I move on to next subject
    - *please do not expect "spoon-feeding"*
  - I will explain the concepts, but you have to work hard so you fully understand them
    - D2L/DEN lecture videos are accessiable to everyone
      - watch the lecture videos at lower speed if it helps
    - *ask me questions* as much as you need!
      - if you are not used to asking instructor questions, you need to get comfortable with it now!
      - you are *expected* to ask me questions if you have trouble with course material or assignments



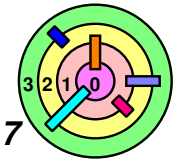
The Importance of "Written Words"

- We communicate (here and in the real world) using "words"
  - spoken words may be unreliable
    - no matter how hard I try, I mis-spoke sometimes
      - I can't slow down much because there is too much to cover
  - "written words" are different
    - you need to take written words seriously
    - especially when it comes to *rules written in words*
      - if we don't take them seriously, why write them down?!
  - things that are not written down can get messy
- If it's writtent that X is the only grading procedure and that we must follow the grading procedure
  - what would we do if you ask us to grade your submission using a different procedure?
    - we won't, because we take *written words* very seriously
- Words on lecture slides are important even if I skip them (because they are written words)



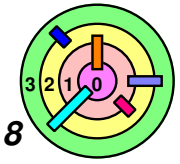
The Importance of "Written Words"

- When it comes to exams, we can only grade based on what you *wrote* on the exam paper (and not what's in your mind)
  - you need to learn to *choose your words* carefully
- Please pay attention to *all* the written words anywhere in the *class web site*, *lecture slides*, posting to class Google Group by *me*
  - setup your email filter to not miss messages from <bill.cheng@usc.edu>



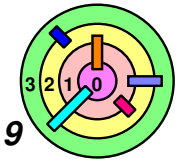
Summary of Important Rules (from PREVIEW)

- **D2L/DEN Videos**
  - D2L/DEN lecture videos are accessiable to all sections of CS 402
- **Kernel Teams**
  - up to 4 students per team will be permitted but no more
  - feel free to use the class Google Group to form group and recruit teammates
    - start with a larger group to work on warmup assignments before you commit to be kernel teammates
- **Late Registration**
  - you will be expected to turn in all assignments on time, no matter when you get into this class



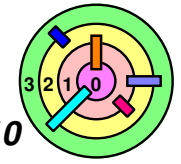
Summary of Important Rules (from PREVIEW)

- **Preparation**
  - the "prerequisites" are for undergrads, for grad students, they are considered "recommended preparation"
    - this class is clearly *not an intro CS class*
    - if you don't have the background, you need to catch up
    - *most students* in this class do *not* have a solid CS background
  - you must *learn C* and *Unix on your own*
    - we will *not* teach you C or Unix/Linux
      - you don't need to be an Unix expert, you just need to know the basics such as directory listing, creating directories, changing directories, copy files, delete files, etc.
      - you need to know Unix/Linux to *test your kernel code*
    - must install a *standard 32-bit Ubuntu Linux 16.04* on your laptop/desktop and work on all your programming assignments on it
      - kernel assignments only works on 32-bit Ubuntu Linux 16.04 (any subversion is fine)



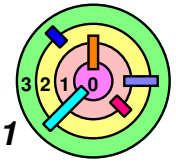
Fairness

- Without *fairness*, grades have little meaning
  - I am required to give you a grade
  - the instructor *must treat all students equally* and cannot give special treatment to any particular student
  - therefore, please do not ask special favors from the instructor because of your circumstances (except for ones that are explicitly allowed by the university)
  - this may seem unfair to you because you believe that your circumstances are special (understandably, everyone does)
  - bottom line, the rule the instructor must follow is that *whatever he offers you, he must offer to the entire class*
    - other than the exceptions that are setup at the beginning of the semester (mostly for students with university-approved accommodations)
    - we definitely will not grade based on effort *(i.e., there will be no partial credit for just "effort")*
      - you get partial credit for *passing tests*



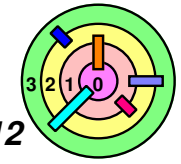
I Must Stick To All My Written Rules

- Some students don't understand why I'm so strict with my rules
  - it's not a power trip for me
  - I am *bound by my own rules*
    - rules *take away power* from me
- I'm responsible of treating all students fairly
- If I apply one rule for one student and don't apply the same rule for another student, that's *totally unfair*
- The only way I know to be fair to all is to stick to all my written rules
- When you ask me to bend a written rule for you, you are asking me to be unfair to other students
  - therefore, I will not bend a rule for you



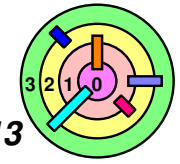
Today's Topics

- Administrative Stuff
  - the instructor *cannot* give D-clearance
    - please use the on-line D-clearance system
  - undergrad students must take CS 350 for Operating Systems
  - our class is *significantly different* from CS 350
    - textbook and programming assignments are all different
- Review Course Organization
  - go over many of the important rules that I will stick to
  - it is extreme important that you read all the administrative lecture slides and the class website
- The discussion section this week will start you off working on "warmup" assignment #1
  - please watch the pre-recorded video and *read the spec yourself*
- Chapter 1
  - 1.1 introduction



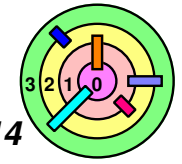
"Flipped Classroom" Model

- You watch *pre-recorded lecture videos* before you come to a scheduled "live and in-person lecture"
  - *live and in-person lecture (or "live lecture")* is for you to ask questions and discussions (I will not repeat a recorded lecture)
  - *or*, you can watch the pre-recorded videos during a "live lecture" and ask me questions during the "live lecture"
  - I will be be available during the entire "live lecture" session
  - you need to figure out which way is best for you
    - what's *most important* is that you need to *understand* all the material in the videos *by the end of the "live lecture" day*
- Lectures in this class has always been recorded on DEN, so that's nothing new and we will stick to that
  - lecture videos will be posted on D2L and class website by 6pm the day before the lecture (usually, a lot earlier)
  - your *assignment* is to watch the videos *before* the live and in-person lecture (or watch it during live lecture)



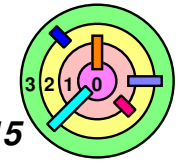
"Flipped Classroom" Model

- Some students really dislike the flipped classroom model (despite its flexibility)
  - the main reason the flipped classroom model is a good fit for CS 402 is that, unlike other classes, students in CS 402 have *very diverse backgrounds* and *learn at different speeds*
    - also, many students need a lot of *one-on-one help* (mainly because they lack some CS background)
  - with a flipped model, students can *learn at their own speeds* and I can give a lot of *one-on-one help* during live lecture time (and live lecture time is *240 minutes per week*, minus the time I spend going over administrative stuff)
    - office hours are shared with students in other classes
  - this class has a *very high level of difficulty* and you need to seek one-on-one help *as soon as possible* when you are stuck
  - please take advantage of the flipped classroom model!
    - *talk to me* if you have trouble adapting to the flipped model so I can make suggestions



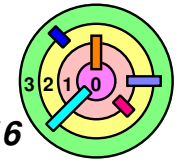
"Flipped Classroom" Model

- "Live lecture" is for you to *ask questions* about the recorded videos or related programming assignments
  - for every live and in-person lecture, there are *two Zoom meetings*
    1) the *primary* Zoom meeting is *in-person*, *in lecture classroom*, and this meeting is set up by DEN
       - you should join this meeting from D2L/USC Brightspace
       - all the live activities in the *lecture classroom* are recorded
       - I will go over *administrative* slides, do a *recap* of what's in the videos, and then ask if anyone has questions
         - if no one has a question, I will end the primary Zoom meeting, walk to my office (may take 10 minutes), and start the *secondary* Zoom meeting to *continue the same live lecture* (but no longer "in-person")
       - come to lecture classroom to meet your classmates and recruit kernel teammates



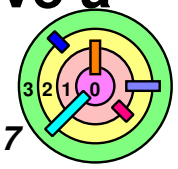
"Flipped Classroom" Model

2) the *secondary* Zoom meeting is set up by me
   - you will not be able to find this meeting on D2L/Blackboard
   - this meeting *will not be recorded*
   - I will do this when I'm alone in my office
   - this Zoom meeting is part of the 120-minute long live lecture (although no longer "in-person", except "virtually")
   - you can ask me questions about recorded lecture videos or programming assignments
   - you can watch the recorded videos at this time and ask me questions about what's in the videos
   - you can ask for a *break-out room* if you need to discuss *your code*
     - if you don't see me in Zoom, most likely, I am talking to students in a break-out room
   - you can use the chat feature in Zoom to chat with other students and recruit kernel teammates
     - I don't usually look at chats



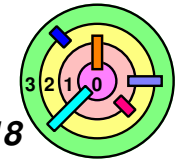
"Flipped Classroom" Model

- Our format may be different from other flipped classroom formats where you get exercises and quizzes during live lectures
  - you will get plenty of exercises when you do your programming assignments
  - we will have *quizzes* (although not during live lecture time)
- You are *expected* to "attend" every lecture (i.e., watch the videos on schedule), you are *not required* to come to *any live lectures in person*
  - but you are *required* to *receive* the *administrative information* given at the beginning of each live and in-person lecture (in the primary live lecture), i.e., *reading the PDF slides*
  - it's *very important* to *keep up with the pace of lectures*
  - this class is *designed* such that lectures and discussions give you background for programming assignments
    - if you fall behind in lectures and discussions, you will have a very difficult time doing the programming assignments



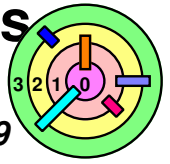
"Flipped Classroom" Model

- We are also using the flipped classroom model for discussion sections
  - we will have pre-recorded "discussion section videos"
    - discussion section videos will be made available at the beginning of the week (and usually earlier)
  - during a live and in-person discussion section on Friday, you are assumed to have watched the recorded videos (or you can watch the video during the live class)
    - the TA will do a *recap* of what's in the videos, and then ask if anyone has questions
    - if no one has a question, the TA will end the primary Zoom meeting, walk to his office (may take 10 minutes), and start a *secondary* Zoom meeting to *continue the same live discussion section* to help students in break-out rooms with assignments
  - there is *no requirement* to come to live and in-person discussion sections on Friday



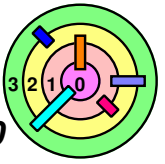
"Flipped Classroom" Model

- The flipped classroom model gives a lot of ***flexibility***
  - in a "regular" semester, each "lecture" is around 80 minutes long (typically divided into two videos around 40 minutes long each) and each discussion section video is around 50 minutes long
    - I have to talk pretty faster so that I can cover all the required material
      - with a recorded video, you can watch it at 75% speed (or speed up) if that's what you would prefer
  - you can pause and resume if you need a break
  - you can watch it ***over and over again***
  - in the end, our class is ***exactly*** the same as a regular CS 402 class in a flipped or a non-flipped classroom model (except that I can give a lot of individual attention)
    - we cover ***exactly the same*** lecture slides and we do ***exactly the same*** programming assignments
    - I don't want people to think that there is more work or less work because of the flipped classroom model



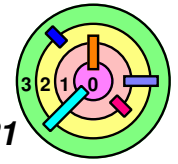
Class Structure & Teaching Staff

- Live and in-person lectures
  - TuTh 9:30am - 11:30am (sections 29908R and 29910D)
    - although there are two section numbers, there is only one real section which I would call the "DEN section"
- Discussion sections
  - Fri 10:00am - 11:10am (sections 29909R and 29911R)
- Midterm: during class time, Tue, 7/8/2025 *(firm)*
- Final: 9:30am-11:30am, Tue, 8/5/2025 *(firm)*



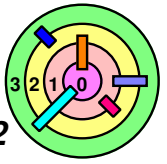
Class Structure & Teaching Staff

- Live and in-person lectures and discussions will be held in lecture classroom and *recorded*
  - recorded live lectures will be posted on D2L/DEN and class website
  - there is *no requirement* to come to live lectures or discussions
    - but you are *required* to *receive* the *administrative information* given at the beginning of each live and in-person lecture (in the primary live lecture), i.e., *reading the PDF slides*
      - of course, it's much better to watch the actual video since *I would cover a lot more* than what's on the slides



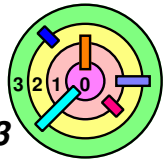
Class Structure & Teaching Staff

- Instructor: Bill Cheng <bill.cheng@usc.edu>
  - email policy: 24 hour turn-around
    - this is my *promise* to you (but applies only to *private* emails)!
  - office hours: on Zoom, Tu/Th 9pm-10pm or by appointments
    - these Zoom meetings *will not be recorded*
    - maximum meeting time for a student will be 15 minutes
    - individual meeting in a break-out Zoom room where you can share your screen if you'd like
      - everyone else wait in the main room, first-come-first-served
      - students in other classes I teach may also come to my office hours
      - if there is a lot of students waiting, you may not end up with a meeting with me
    - it's best to come to *secondary live lectures*, send me email, or post to class Google Group
      - if you send me a *private email*, I *promise* that I will reply within 24 hours



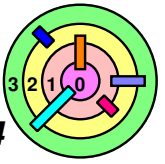
Appointments

- I would grant appointments with me only under very special circumstances and *only for personal/private administrative matters*
  - if such matters can be handled in a break-out room on Zoom (which is a private space), that would be preferred
  - if you want to talk to me about course materials or programming assignments, come to *secondary live lecture* or *office hours*
    - since I do not approve time conflicts, if you are registered in this class, you must be *available during secondary live lecture*
      - that's a lot of hours and you cannot say that you are not available during that time
    - using appointments to get extra help would be unfair to other students (unless I accept appointments whenever I'm asked, and that's not feasible, given the number of enrolled students)



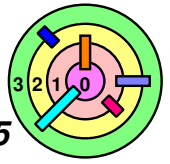
Office Hours

- Please understand that secondary live lectures and office hours are for me to *help* you, not to "tutor" you
  - same goes for the TA's live lectures and office hours
  - please understand that *we are not your paid tutors*
  - Viterbi have tutoring services, but they are for undergrads
    - if you are a grad student, you are expected to be able to learn on your own
    - if you are not sure how to do that or where to start, come to secondary live lectures and office hours and ask me and I'd be happy to give you pointers regarding how to learn on your own or get up to speed with the class (but you have to work hard)
      - your future employers expect you to be able to learn certain things on your own and you need to learn how to do that



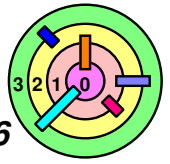
Class Structure & Teaching Staff

- TAs
  - Bowen Song <bowenson@usc.edu>
    Ali Abbasi <abbasia@usc.edu>
  - email: 24 hour turn-around
  - the TA's job is to *help* you with the course materials and programming assignments, *grade exams*
    - TA cannot *do work for you* (such as *find bugs* in your code, *write code* for you to use, etc.)
    - TA *cannot tell you what code to write*
    - TA *cannot look over your code* or *comment on your code*
    - it's not the TA's job to "tutor" you
    - TA can help you with learning to use the debugger
- You can go to *any* TA for help with course materials and programming assignments
  - TAs are shared except for *grading of exams*
    - exams in different sections are different!



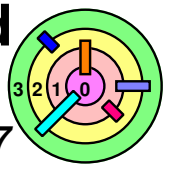
Office Hours

- Office hours are for answering questions
  - they are not intended for finding bugs in your code
    - especially since each student can only have 15 minutes
  - *finding bugs is your job* and it's an important that you learn to *acquire such a skill*
  - if you need debugging help, we can only give you suggestions and tell you what `gdb` commands to try
- Please understand that *we don't know where your bugs are*
  - some bugs are so difficult to find, even for professionals
  - therefore, please do not expect that we can find your bugs
- Some students think that we are holding out on them, that we know where the bugs are and we are just not telling them
  - that may be the case when the bugs are trivial and we want you to learn to spot the bugs
  - often times, we just don't know where your bugs are (there are just too many possibilities)



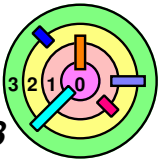
Office Hours

- When you come to a Zoom office hour, ***raise hand*** immediately because Zoom will create a queue based on raised hands
- If no one comes to an office hour, we may walk away from Zoom temporarily (but we will not be far)
  - we will put a note on the screen to say that we are away momentarily
  - call out our name or send us email to ask us to come back to Zoom
  - if you don't see a note on the screen, it's most likely because we are in a break-out room and we may not know that you are waiting (you can send us an email in case there is an operator error)
- If an office hour is moved or canceled, I will add a news item in the News section of the class home page
  - if an office hour Zoom meeting is not active, you should check the class home page to see if it has been moved or canceled



Class Structure & Teaching Staff

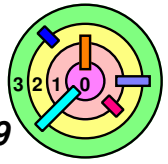
- **Graders:** ***(TBD)***
  - **email: 24 hour turn-around**
  - **the grader will hold regrade sessions (if necessary) after you get grade notification email**
  - **we have different rules about grader involvement for our class**
    - **the grader's only job is to *grade your programming assignments***
    - **it is inappropriate to contact the grader about an assignment (especially about "how many points I would get if I do it this way") before the assignment is due**
      - **you should be able to figure it out from the spec and the "grading guidelines" or you can just ask me**
      - **the grader will not answer questions before the assignment is due**



Class Resources

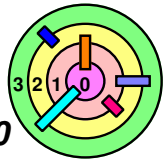
- Class web page: http://merlot.usc.edu/cs402-m25
  - everything about this class is there
    - anything related to *grading*, you are *required to know*
  - lectures and assignments are *password protected*
  - get familiar with it
    - if you are not used to reading a lot of stuff, you should start reading a lot of stuff in this class
      - it's important to learn how to *read* documents and *interpret* them *correctly*

- If you see *inconsistencies*, especially regarding any type of "rules" between what's on the class web page, what's on a set of lecture slides that has been covered in class, or what I said
  - usually, the lecture slides are correct
  - but you should send me email and check with me as soon as possible
    - so that things can be made consistent again



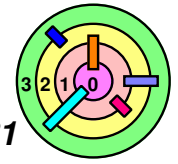
Lectures

- The posted lecture slides have a lot of details
  - I will *not* cover every posted lecture slides
    - not even for *this* set of lecture slides!
    - there's not enough time
    - although *you will be responsible for everything posted* in lecture slides (and the corresponding materials in textbook)
      - *except* the ones that are marked with a grey ✖ in the *lower left corner* of the slide
      - feel free to ask me about things on the lecture slides but were not covered during lectures
  - when you watch a lecture video, you can *pause at the beginning of each slide* and read the slide, then *listen to my explanation*
- *Exam questions* will be *primarily based on* the lectures and lecture slides
  - it's important that you *understand* the lecture slides well
  - you should use the lecture slides as a study guide



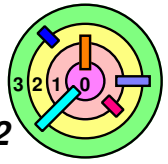
Discussion Sections

- I will use the discussion section videos to go over *background information for programming assignments*
  - these videos will be posted at the beginning of the week
  - the TAs will answer questions about the video during a live discussion section
    - where there are no more question, the TA will close the live class, walk to office and start a secondary live discussion section to answer questions in break-out rooms
- Please understand that discussion section material are *NOT* substitute for reading the *specs* and the *grading guidelines*
  - you are expect to read the entire *spec*
  - you are expect to read the *requirements* the spec refers to
  - you are expect to read the *grading guidelines*
  - they are your responsibility
- *Exam questions* can also be based on posted discussion section slides



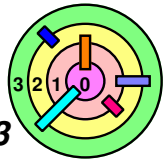
Quizzes

- To make sure that you are *keeping up* with pre-recorded lecture and discussion video schedule, we will have *quizzes* on some Fridays
  - you will be quizzed on everything up to the current week with *focus* on the *lecture and discussion videos that hasn't been quizzed*
    - compare to exam questions, quiz questions will be "easier" questions, assuming that you have watched the videos
  - you download quiz questions (in PDF) and answers text file at the beginning of the quiz and you *upload the filled-out answers text file* before end of the day using a submission web form
  - grading details will be provided before the first quiz (rehearsal)
    - it will be the same as exam grading



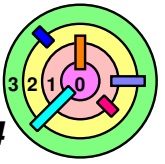
Quizzes

- Quizzes will be take-home, you download it at 3pm and you must submit *before midnight*
  - starting at midnight, you lose 5% for every late minute
  - since it's a 9-hour quiz, you should be able to find time to take the quiz on Friday
    - no makeup and you cannot take the quiz at a different time since the answers will be posted soon after
  - we will automatically *drop two of your lowest quiz scores*
  - we cannot make exceptions
    - e.g., some students have Friday sailing classes and maybe out at sea without an Internet connection
      - this is a course time conflict with our discussion section and it's not approved
    - if this only happens twice in the semester, make sure you don't miss any of the other quizzes



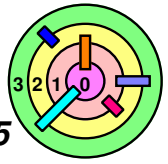
Quizzes

- Quizzes are open book, open notes, open Internet (not open friend, of course)
  - starting with Quiz 1, you are required to *sign an Honor Code Pledge* to promise that *you will not cheat*
    - *no signed pledge, no quiz*
  - one pledge for the quizzes (and one for the midterm and one for the final)
- We will drop the lowest 2 quiz scores



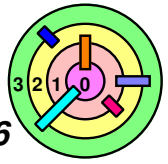
Quizzes

- ***Multiple-choice*** **questions**
  - **unless *explicitly* stated, every multiple-choice question has *one or more* correct answers**
    - **even if the question asks, "which *statements* are correct" or "under what *condition*", it *can* have one or more right answer(s)**
      - **please ignore minor grammatical and spelling mistakes**
  - **if a statement is *inconsistent* or *incorrect*, it must be considered to be a *"false"* statement**
    - **if the question asked you to select all the correct statements, you must not select it**
    - **if the question asked you to select all the incorrect statements, you must select it**



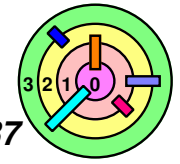
Quizzes

- Grading of multiple choice questions
  - if you select all the correct choices, you get 2 points
    - if only one correct answer, it's worth 2 points
    - if two correct answers, each is worth 1 point
    - if three correct answers, first one is worth 1 point, the rest worth 0.5 point each
    - if four correct answers, each is worth 0.5 point
  - no question will have 5 or zero correct answers
  - for every ***wrong*** answer you have selected, you ***lose 1 point***
    - probably not a good idea to guess (unless you are pretty sure)
  - points you get for a problem cannot be negative
    - therefore, if you are going to leave an answer blank, might as well take a guess (since it cannot hurt)
  - your answers must be separated by "separating characters"
    - e.g., "12" will not be interpreted as "1 2" (even though there is no 12th answer)



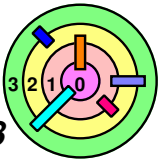
Class Discussion (Google) Group

- Google group
  - student-to-student discussions about programming assignments and course materials
  - exchanging *ideas* are allowed
  - posting code is *not* allowed (short code segments to illustrate ideas are allowed; short means < 3 lines *and* < 3 function calls)
    - *first offense* (in the entire semester) gets a warning (unless it's a lot more than the threadhold)
    - *2nd offense*, you will lose 50% of the corresponding assignment points and lose posting privileges
  - instructor and TAs will also post answers to questions here
    - if appropriate for whole class
  - you can get *extra credit* if you post *timely* and *good/useful* answers to other students' questions for *kernel* assignments
    - if you just repeat what others are saying, you are being "helpful" but what you post will not be "useful" since it's already been said



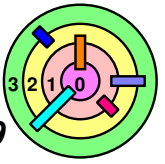
Class Discussion (Google) Group

- You *must be a member* of the *class Google Group*
  - *all* important announcements will be posted to this group
- You are expected to read *every one of my posts* to the class Google Group
  - *my posts* to class Google Group is considered *course material*
    - I use it to explain lectures (if someone asks)
    - I use it to explain programming assignments (if someone asks)
    - I may ask *exam questions* from them



Class Discussion (Google) Group

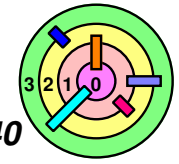
- If you are on the class roster, I will add your USC email address to the class Google Group *after Lecture 1*
- If you are on the wait list or are considering taking this class, you can make a request to join the class Google Group by sending me an email
- You must not block class Google Group messages
  - if you set your delivery preference to "no email", I will change it to "all email"
  - if you don't want to see the posts, you can setup a filter to automatically refile all these messages (although that's not recommended)



Going Into "Secondary Live Lecture"...

- Normally, when one pre-recorded lecture video is over, you should just continue to the next pre-recorded video
  - Lecture 1 is different because the first part is not pre-recorded (just like a primary live lecture)
  - now we will go to part 2 of Lecture 1 and part 1 of Lecture 1 (which are pre-recorded)
    - this way, you can experience going from a "primary live lecture" to a "secondary live lecture"

- I'm giong to start the ***secondary live lecture*** on Zoom soon
  - go to class home page and click on Videos, scroll all the way to the bottom and click on the link for Zoom meeting IDs
    - make sure you have signed into Zoom (http://usc.zoom.us) using ***USC SSO authentication***
    - you can watch remaining lecture videos during this meeting
    - feel free to ask me questions during this "live lecture"



Going Into "Secondary Live Lecture"...

- Starting with next class, "primary live lecture" will mostly be ***short***
  - I will give ***administrative information***, do a ***quick recap*** of what's in the recorded videos, and ask if you have ***questions***
  - when there are no questions, I will go to my office to start the "secondary live lecture" to continue the live class to mainly answer your questions in a break-out room, all the way to the end of the live class
    - you can ask me questions in the main room if you don't need to discuss your code
  - you are ***expected*** to come to secondary live lectures to ask me questions (if you have them) about lectures and assignments
- Although before doing that, I will give a quick run through of our ***class website*** so you know where things are