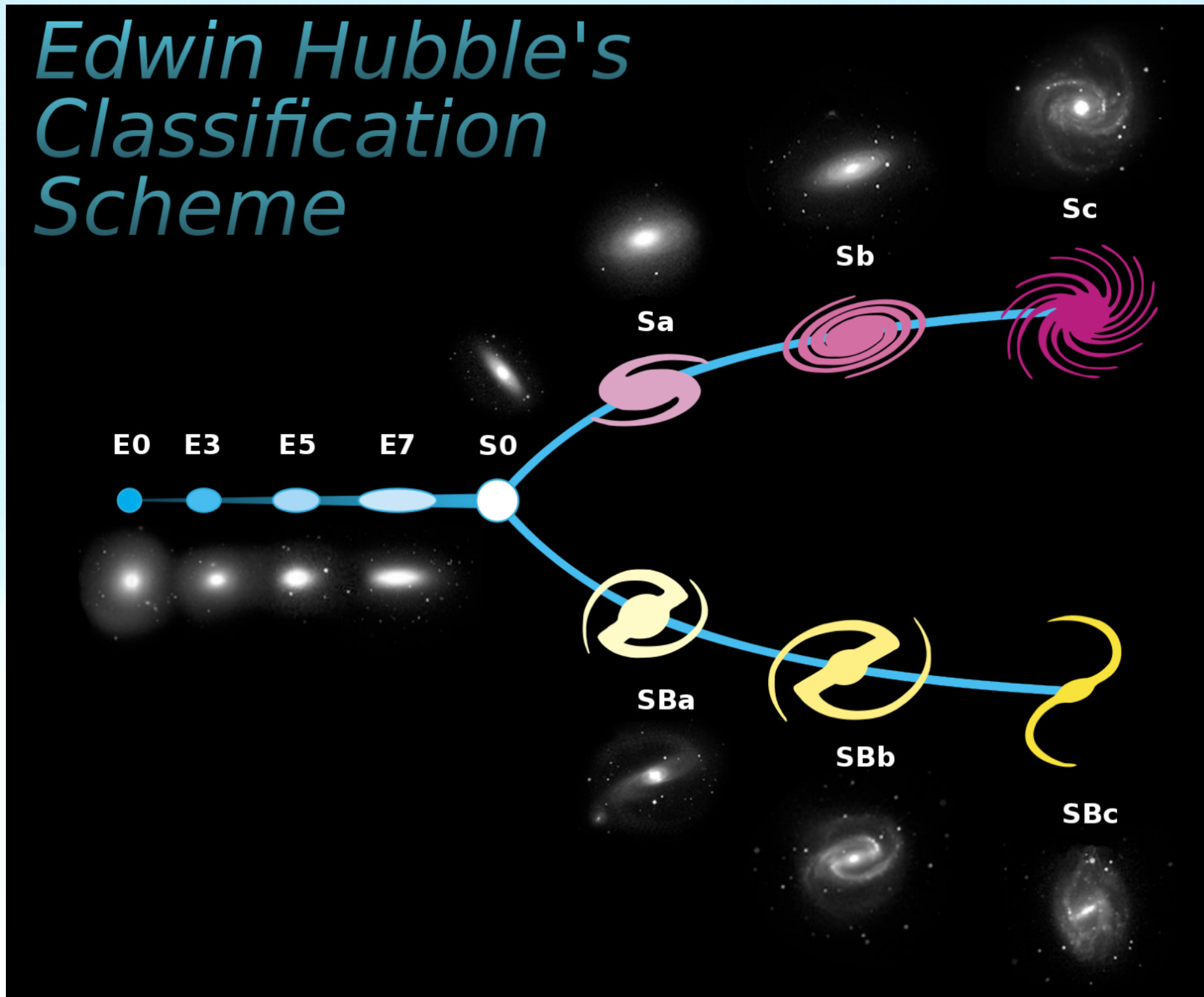


# C++ - Assignment 3

## Practicing classes

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# Galaxies and their classification



[Wikimedia Commons](#)

# Write a C++ class for describing galaxies

If you want to know more about galaxies, see [here](#)

- A galaxy object should contain the following (private) data:
  - Hubble type: string or alternatively an enum
    - Allow for the simplified classification in terms of *E0-7*, *S0*, *Sa*, *Sb*, *Sc*, *SBa*, *SBb*, *SBc* and *Irr*
  - Redshift: double  $z$  in the range  $[0,10]$
  - Total mass: double  $M_{\text{tot}}$ , in the range  $10^7$ - $10^{12}$  solar masses
  - A stellar mass fraction double  $f^* = M^* / M_{\text{tot}}$ , in the range  $0$ - $0.05$
- The class should also contain several member functions (detailed in the next slide)
- The main program should demonstrate use of the class through declaring and using objects
- A mark will be deducted if your program produces any compilation warnings or errors



# Write a C++ class for describing galaxies

- **Core marks (3 marks):**
- Your class should include
  - A default constructor; a parameterized constructor; a destructor (*0.5 mark*)
  - A member function (with implementation outside the class) to print out a galaxy object's data and a member function to change the galaxy's Hubble type ( *1 mark*)
  - A member function to return the stellar mass  $M^* = f^* / M_{\text{tot}}$
- Your `main()` function should demonstrate the use of all of the above.
- It should also use a vector to store at least 2 different objects of sufficient complexity and use an iterator to access these objects and print their content (*1 mark*)

# Write a C++ class for describing galaxies

- **Challenge mark (1 mark):**
- Galaxies contain satellite galaxies as well (e.g. Milky Way has large and small Magellanic Clouds). Modify your class so each galaxy object can have satellites, as follows
  - Include a private vector object inside your class to store satellites (which are galaxy objects)
  - Add a new member function to add a satellite galaxy
  - Modify your print function to print the number of satellites and, if non-zero, print their properties as well
  - Again, the functionality must be demonstrated in your main program
- Assignment total: **4 marks**
- There are negative marks for compilation errors and lack of using the house style (-1 each)
- You will lose all marks if you don't submit the code!
  - We were lenient the first time around, but check on Blackboard after submission that you do see the files!

# Deadline: Friday 3/4, 7 pm

Update to previous instructions:  
if you need to resubmit, you should  
do it by noon on Friday

**if you resubmit later we can't take  
your resubmission into account**

This is because we can't catch up with resubmission forms and emails as we will be doing lab interviews in the nuclear labs

**This encourages you to submit & cross-check earlier than the last minute of the deadline!**



# Reminder about how **not** to ask for help to demonstrators/course leaders:



- I have an error in printing things out in my code, can you help?

This only works if there is a demonstrator sitting near you, and even then it's not ideal



# Reminder about how **not** to ask for help to demonstrators/course leaders:

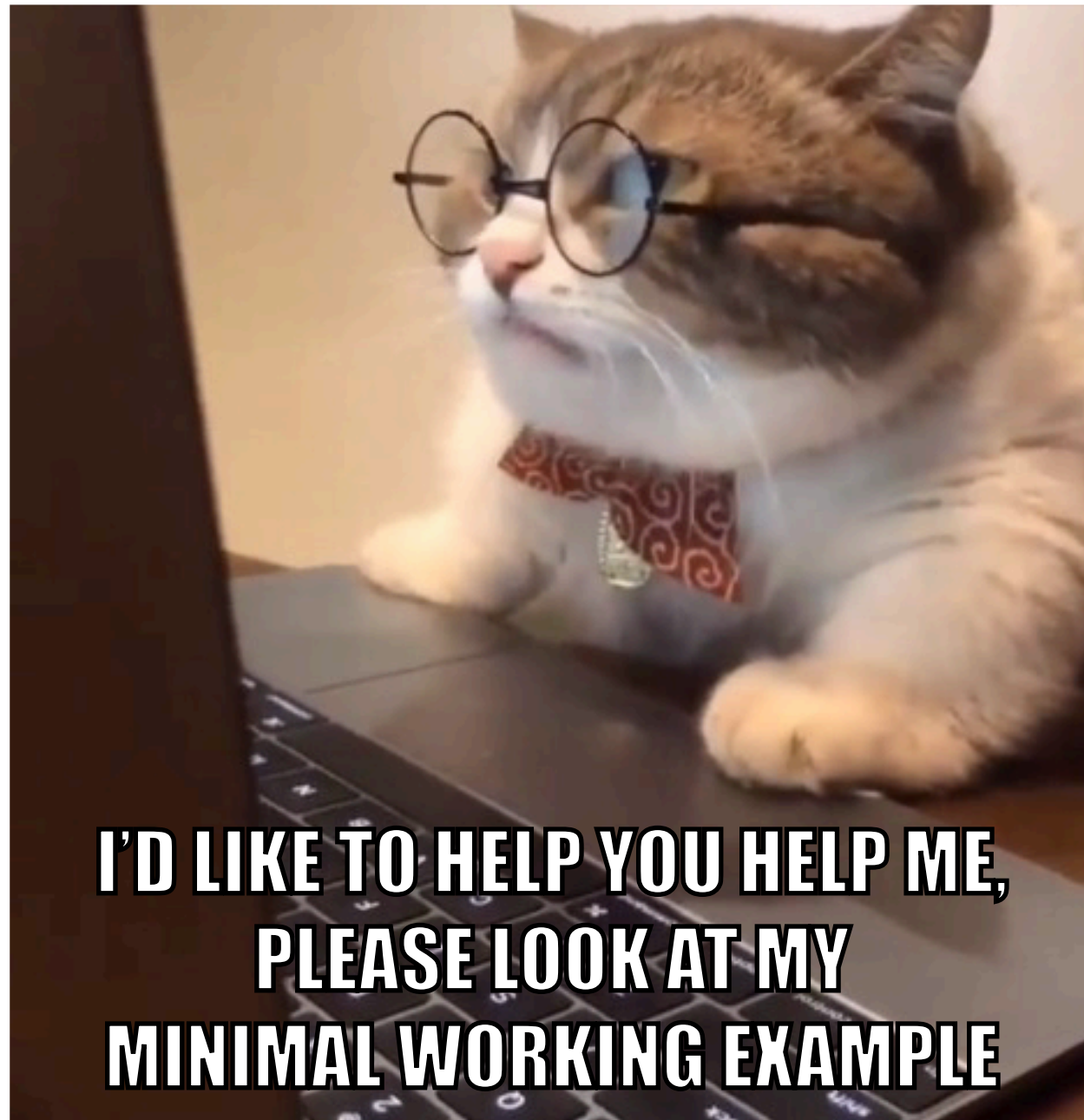


- I have an error in printing things out in my code
- I am using the printf function like this:  
`printf(current_year, "%s");`
- It does not compile
- Can you help?

This only works if your demonstrator remembers the syntax of printf



# Reminder about how to ask for help to demonstrators/course leaders:



- I have an issue with the printf function
- This is a standalone C++ code where I have isolated the issue

```
int main (){  
    int current_year = 2023;  
    printf(current_year, "%s");  
    return 0;  
}
```

- You can reproduce my error if you “Build task” in Visual Studio Code with g++11 on a mac with Big Sur OS and an Intel chip

This way a demonstrator can just copy paste the code, look at your error with the compiler, and advise on what’s going wrong!

<https://stackoverflow.com/help/minimal-reproducible-example>