PHY480 Project report structure

* Abstract
  + Summary of each section (Literature review, progress on project, project plan).
* Introduction
  + Briefly explains the context of the project.
  + Why did you do this project?
  + Why is it interesting? (various applications to astrophysics problems, how did they use NBODY method for the problem)
  + Talking about the progress on the project. What did you do?
* Body
  + Literature review (5-6 pages) – present as a narrative (story), linking each section
    - What is NBODY simulation?
      * General introduction on the basic NBODY problem (introducing the acceleration equation). Can also talk about the position vector equation, how does it help in solving this problem.
        + Introduce the basic equations used (where N>2 in the self-gravitating system)
        + Can also include stuff about 2nd and 4th order. (skim through 4th order predictor-corrector method)
      * Can talk about the history of NBODY simulation (in 1970s the first NBODY simulations carried out)
    - Why did you do NBODY simulations? – This explains the MOTIVATION of our project.
      * To what astrophysics problems does the NBODY method apply?
        + Accurate NBODY simulations done to look stellar or planetary dynamics. NBODY used in galaxy structures, but it is not that accurate.
        + Astrophysics problems:

Planets

Planet-star interactions in star system

The late stages of planetary formation (in the Oligarchic phase where we have remnant planetesimals and the protoplanets)

Nice model- briefly reminding about the nice model. Here, there is only gravitational interaction between the planets of our solar system

Multiple systems

Star-binary interactions in stellar clusters

Clusters (more technical)

The relaxation and dynamical evolution of the cluster due to the star-star interactions. These interactions could cause either mass segregation at the centre of the cluster or introduce a core collapse supernovae

Could talk about globular clusters which are sources for gravitational waves.

* + - * + Explaining the astrophysics problems
        + How did the researchers apply the NBODY method in their paper?
  + Progress on project (4-5 pages)
    - What you did in the project?
      * Explain the 2nd order code (can include the code in the appendix)
      * Give the important information so that the reader will be able to code it also.
        + Giving generic details of the steps you used.
        + Tell them why you used fortran as the language.
      * You should explain the steps carried out to produce these simulations.
      * Provide the equations you used in the code.
      * Also include the initial results obtained from the tests applied to the code. Attach the figures produced from these tests. (for eg. The test on the stability of the solar system, the fractional energy test)
    - Talk about the main skill you learned from this project.
      * Looking for bugs and correcting them.
      * Increasing the speed and efficiency of the code
  + Project plan (1 page)
    - What work to be done in semester 2?
      * The necessary steps
    - Include the time each step can take (approx.)
    - A **GANNT chart** would be perfect!
* Conclusion
  + Short and concise
  + Summarise the sections of the report
    - Summary of the various applications on different astronomy problems, the actual simulations you carried out, and then talk about the project plan