

PHYSICS 653: TERM PAPER INFORMATION (8/28/07)

Due dates:

(0) Brief meetings with CLH, F 8/31 through M 9/10. (SIGN UP SHEET Th 8/30)

(1) Topic proposal: due Th 9/13/07.

(2) Draft: tentatively due Thurs 10/25/07 Each paper will be read by two other class members (“peer review”), besides myself.

(3) Peer review reports: within 2 weeks after paper is turned in

(4) Final paper: tentatively, due the last week of class, i.e. circa 11/28/07.

Length: Typically 4000 words + 4 figures + 15 eqns + 15 references; roughly 9 typed pages (not including figures/references), similar to a Phys. Rev. Letter. This is about as much material as is covered in a 1.5-hour lecture. *Draft is ideally about 75% of this.*

Content: Do not just summarize, but synthesize, analyze, or compare the papers. How much do different authors agree/disagree? (They may agree on the physics, but embody it in mathematically different models). In their derivations, must intermediate steps be filled in? What are the important points? If they have obscured their result by writing it in utmost generality, can you illuminate it by specializing to the most elementary or physically interesting case?

Try to include at least some theory and some experimental applications. Original research topics – e.g. simulations – aren’t ruled out, but are strongly discouraged: you have much less control over how much work is done and when it gets done.

Intended audience: Physics 653 students. Assume the common knowledge taught in the course but not more. Avoid topics such that the central results can be understood only with advanced techniques.

What’s a good paper – criteria: The following are the important considerations I use in judging term papers:

(1) depth – show some physical reasoning, some simple explanations of why something happens;

(2) digestion – breadth of references; did you reorganize and synthesize what you read?

(3) presentation. Try for topics which will make a good story – something that would be fun to hear in a lecture.

Topic proposal: An abstract, summary, or outline of the question you want to answer. Give TWO references (not including books!) which you’ve already seen which will be important in writing the paper.

Acceptable topics: “Statistical physics:” mostly, problems dominated by idea of an *ensemble*; usually but not always $\hbar = 0$; often but not always transitions, phase diagrams; often but not always entropy or its competition with energy. This is an opportunity to explore one of the (many) topics not covered in P 653 this year, or to go deeper in one of the covered topics. It’s fine if the topic is related to your intended research, but I suggest something slightly off your main track, such that you wouldn’t necessarily have studied it in detail.

Scope of topics: You need to work to make the topic specific enough. Most of the buzzwords in the list below would be too vague or broad for a paper title. In some (surprisingly few) areas, the basic ideas are so well presented in books that you would be reduced to paraphrasing them; in that case you should find a narrower topic where you can apply those well-known basic ideas (since the first priority of this project is supposed to be experience in *synthesizing* information).

How to investigate topics: If you don't know anything, I will hand out (soon) a list of possible topics. First find entry points to the literature. To find more recent papers, you can use the Science Citation Index.

Special options:

(1) I welcome coordinated proposals by two or three students. You can cooperate on finding and digesting basic references; the resulting papers should be on complementary topics.

(2) AUDITORS: You're welcome to participate in the term paper process. If you're a G2 or G3, you might do a topic pre-approved by one of your Special Committee members to serve as your A-exam question.