Physics 3320 **Quantum Physics II** **Spring 2013**

Class Hours: MWF 2:00 - 2:50 pm
Classroom: MH2002
Text: Kenneth Krane, *Modern Physics* (2nd edition)
Instructor: Professor Jacques G. Amar
Office: MH5006
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Grading:

Homework	20%
First Exam	25%
Second Exam	25%
Final	30%

Week Of:	Topics	Reading
Jan. 7	Review, Pauli exclusion principle, Periodic table	Chapter 8
Jan. 14	X-ray & optical spectra, Hund's rules, Lasers	Chapter 8
Jan. 21	Multielectron wavefunctions, LS coupling	Notes
Jan. 28	Hydrogen molecule, ionic & covalent bonds	Chapter 9
Feb. 4	Molecular spectra	Chapter 9
Feb. 11	**Review, Exam 1**	Chapter 8-9
Feb. 18	Quantum statistics, Blackbody radiation	Chapter 10
Feb. 25	Bose condensation, Electronic heat capacity	Chapter 11
Mar. 4	***Spring Break***	
Mar. 11	Cohesion of solids, Band theory, Conductivity	Chapter 11
Mar. 18	Semiconductors, Superconductivity	Chapter 11
Mar. 25	**Review, Exam 2**	Chapter 10-11
April 1	Nuclear masses, radioactive decay	Chapter 12
April 8	Nuclear reactions, fission, fusion, medical physics	Chapter 13
April 15	Elementary particles	Chapter 14
April 22	Astrophysics & General relativity.	Chapter 15

Final exam: Thursday, May 2 12:30 – 2:30 PM

PHYS 3320: Guidelines for WAC paper and Honors projects

To satisfy the WAC requirement a written paper will be required. It is due on Monday, April 23 and should discuss the relevant physics, along with at least 1 key person who made the discovery, as well as the implications and applications of the discovery. The main text of your paper should be at least 4 pages long using single-spacing with font size 12. A front cover page with title and student's name as well as bibliography/references page should also be included in which the sources of the information in the paper is cited. The paper should be divided into 3 parts with each part 1 – 1 ½ pages long: (1) a discussion of the relevant physics (2) a discussion of the context and circumstances of the discovery (e.g. who discovered it and how) (3) a discussion of the impact (or possible impact) of that contribution to science and technology.

Some possible topics include:

Scanning tunneling microscope + quantum tunneling [Binnig/Rohrer]
Pauli exclusion principle + periodic table [Pauli, Mendeleev]
Molecular absorption (vibrational and rotational) + greenhouse gases (global warming)
The discovery and invention of the laser [Schawlow, Townes]
Bose-Einstein condensation [Einstein, recent experimentalists: Cornell, Ketterle, Wieman]
Superfluid Helium [He4: Landau, Feynmann, expt. Discovery, He3: Osheroff, Lee, Richardson]
Semiconductors (p-n junction and transistor, LED, solar cell)
[Bardeen, Shockley, Brattain….]
Nuclear fission [Meitner], Nuclear fusion and stars [Bethe]
Superconductivity and BCS theory [Bardeen, Cooper, Schrieffer]
High-temperature superconductors [Bednorz, Muller]
The Josephson effect, SQUIDS [Josephson]
The development of GPS and general relativity
3K Background radiation [Penzias, Wilson and Mather/Smoot]
Holography [Gabor], CCD [Smith]
Graphene [Geim, Novoselov]
See also: http://nobelprize.org/nobel_prizes/physics/laureates

Along with your paper, you should include a copy of at least 1 relevant article which you used as source material (e.g. Nature, Science, Scientific American, Physical Review etc.). If at all possible you should also include at least one book as source material, and in that case you should include a copy of the front page/pages indicating the title, author, publisher, date of publication etc.

I would like each student to write a WAC paper on a different topic. In order to ensure this, please e-mail me your top 2 choices by Friday, February 22. I will then "re-arrange" if necessary to avoid duplication.

Honors projects will be assigned later in the semester.