

Physics 723 Quantum Optics
Tuesday/Thursday 10:00-11:15

Spring 2018
BPB 248

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Textbook:

G. Grynberg, A. Aspect and C. Fabre, *Introduction to Quantum Optics* (2010).

Suggested Reading:

C. C. Gerry and P. L. Knight, *Introductory Quantum Optics* (2008).

M. Fox, *Quantum Optics, An Introduction* (2007).

M. O. Scully and M. S. Zubairy, *Quantum Optics* (1997).

R. Loudon, *The quantum theory of light, 2nd ed* (1983).

L. Mandel and E. Wolf, *Optical Coherence and Quantum Optics* (1995).

A. Yariv, *Quantum Electronics, 3rd ed* (1989).

L. Allen and J. H. Eberly, *Optical Resonance and Two-Level Atoms* (1975).

M. Sargent, M. O. Scully and W. E. Lamb, *Laser Physics* (1974).

Outline:

1. Evolution of interacting quantum systems
2. Semi-classical approach: quantum atoms and classical electromagnetic field
3. Principles of lasers
4. Quantization of free radiation
5. Free quantum radiation
6. Interaction of atoms with the quantized electromagnetic field
7. Nonlinear optics

Term Project: Presentation of a research paper

Study a published research paper and prepare a presentation explaining and discussing this paper. The project will include a written report and an oral presentation to the class.

Learning Outcomes:

The students will gain familiarity and understanding of the classical and quantum theory of light and its interaction with matter.

Evaluation:

Due Dates:

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|--------------|-----|----------------------|
| problem sets | 20% | approximately weekly |
| term test | 20% | 1 Mar. |
| term paper | 20% | 19 Apr. |
| final exam | 40% | 8 May |

There will be a penalty for late assignments.