PHOT 301: Quantum Photonics
LECTURE 00

Michaël Barbier, Fall semester (2024-2025)

COURSE INFORMATION

Instructor

Dr. Michaël Barbier
e-mail: michaelbarbier@iyte.edu.tr
Office: door on the right of Z5
Hours: 9:00-17:00 (via appointment)

Teaching Assistants

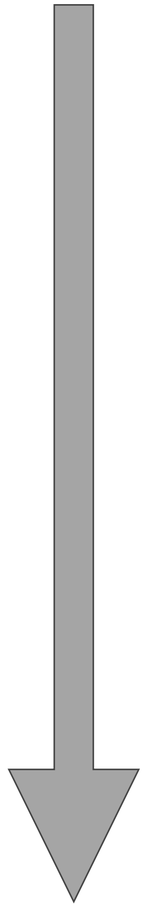
Yağız Oyun
e-mail: yagizoyun@iyte.edu.tr
Office: Z9B
hours: TBA

Course Schedule

Tuesday	13:30 – 15:15	Building F, lecture room D2
Friday	13:30 – 15:15	Building F, lecture room D2

CONTENTS OF THE COURSE

- Wave function & Schrödinger's equation
- "Mathematical" formalism
- Electrons in materials
- Quantization of light: photons
- Photons interacting with atoms/materials



COURSE MATERIALS

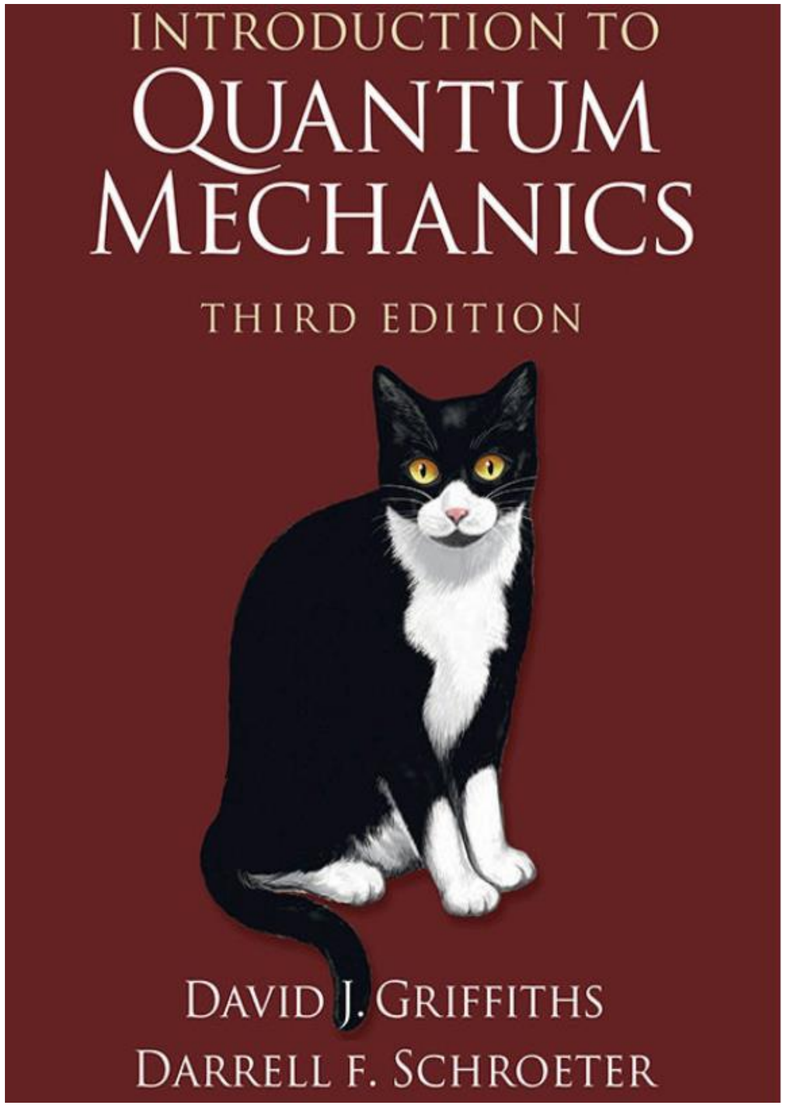
Course book

D.J. Griffiths, Introduction to Quantum Mechanics, Pearson

D.A.B. Miller, Quantum Mechanics for Scientists and Engineers, Cambridge

Supplementary material

C.C. Gerry and P.L. Knight, Introductory Quantum Optics, Cambridge, 2005



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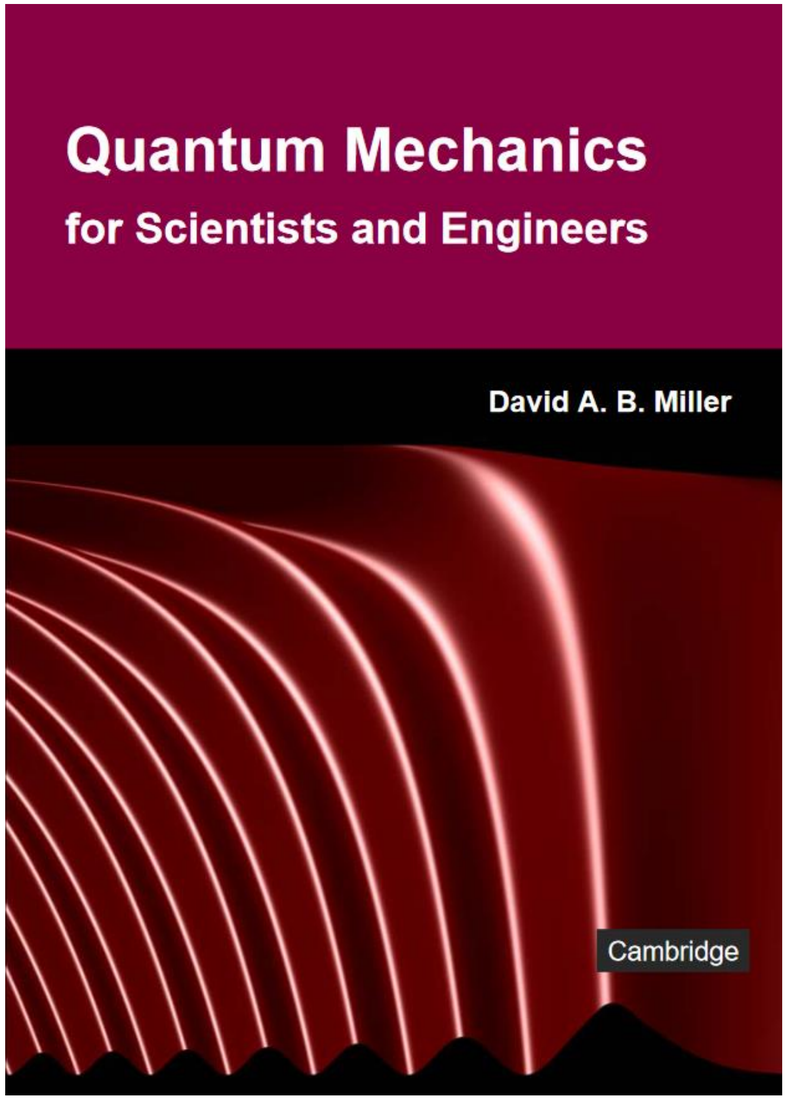

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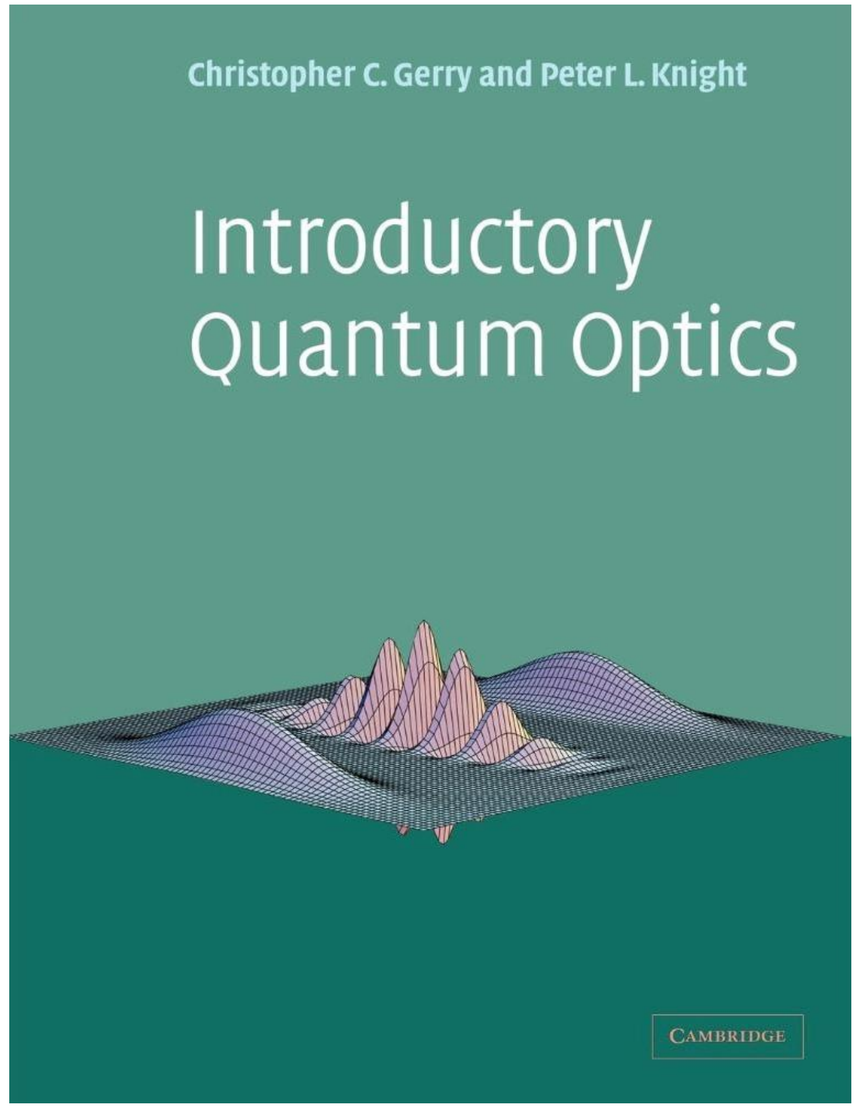

COURSE MATERIALS

Supplementary material

David Miller's webpage on quantum mechanics
https://dabm.stanford.edu/teaching/quantum-mechanics/

QuVis: Web site with quantum mechanics simulations

QuTip: Python library quantum mechanical simulations

Applet(s) by Paul Falstad for 1D quantum systems (other applets available on www.falstad.com/)

OVERVIEW OF THE COURSE

week	topic
Week 1	Waves and Schrödinger's equation
Week 2	Time-independent Schrödinger's equation
Week 3	Quantum mechanics formalism: Functions and operators
Week 4	Approximation methods
Week 5	Approximation methods (Cont’d)
Week 6	Periodic structures, Band structure, Bloch functions
Week 7	Midterm exam
Week 8	Methods for one-dimensional problems: Transmission, bound states
Week 9	Angular momentum and Hydrogen atom
Week 10	Spin
Week 11	Identical particles
Week 12	The density matrix
Week 13	Harmonic oscillators and photons
Week 14	Absorption, spontaneous emission, and stimulated emission

COURSE SYLLABUS AND CLASS WORKFLOW

Homework/projects

- Working together on solutions allowed
- But .. individual reports

Exams

- Theoretical open questions
- Exercises are important