PHOT 222: Quantum Photonics
LECTURE 00

Michaël Barbier, Spring semester (2024-2025)

COURSE INFORMATION

Instructor

Dr. Michaël Barbier
e-mail: michaelbarbier@iyte.edu.tr
Office: door on the right of Z5
Office hours: Friday 11:00 – 13:00
(or via appointment)

Teaching Assistant

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

Course Schedule

Tuesday	10:45 – 12:30	Building F, lecture room D3
Friday	8:45 – 10:30	Building F, lecture room D3

CONTENTS OF THE COURSE

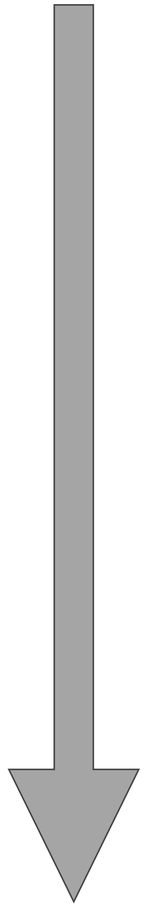
- Relativistic effects

- Quantum mechanics of light and matter: de Broglie,
  Blackbody radiation, Photoelectric effect, …

- Quantum particles in potentials and tunneling

- Electronic structure of many-electron atoms

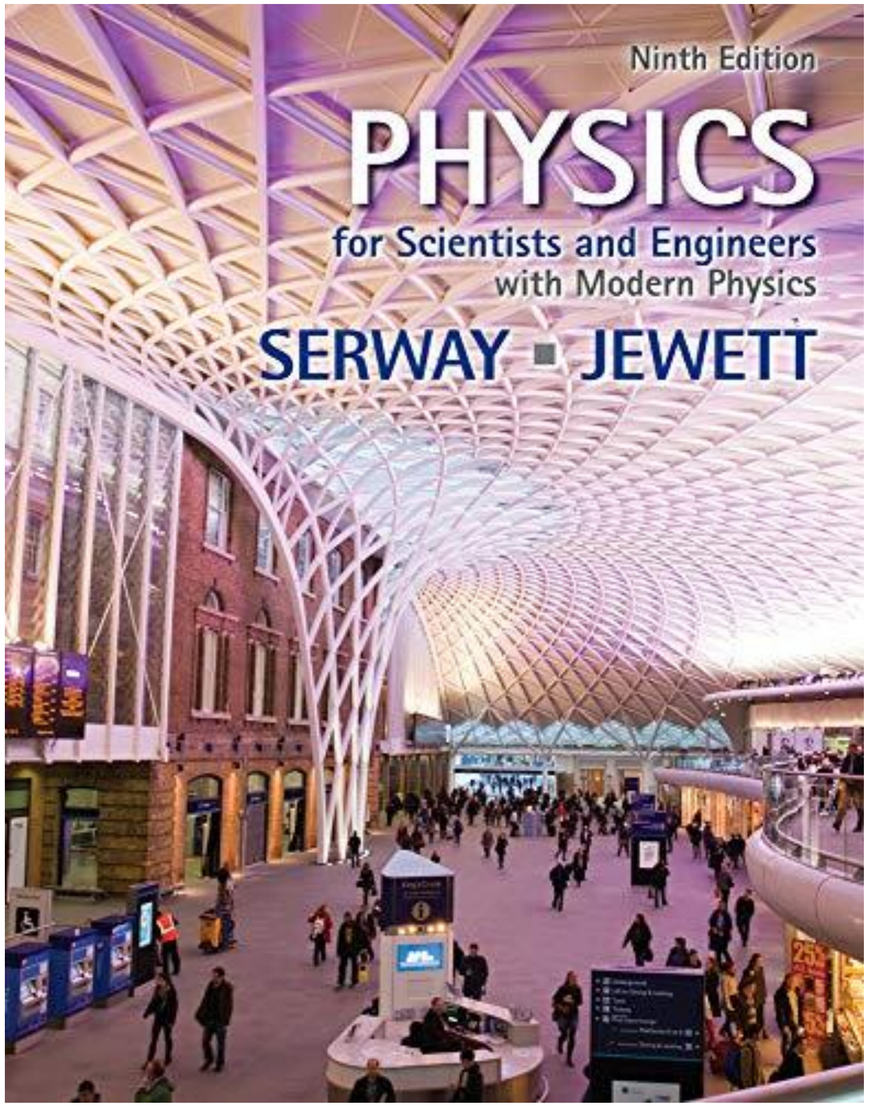
- Spectra of molecules &
  Band structure of crystalline materials



COURSE MATERIALS

Course book

R. A. Serway and J. W. Jewett,
Physics for Scientists and Engineers
with Modern Physics, Part 6,
9th edition (2013),
Cengage Learning



Supplementary material

Beiser, Concepts of modern physics,
McGraw-Hill

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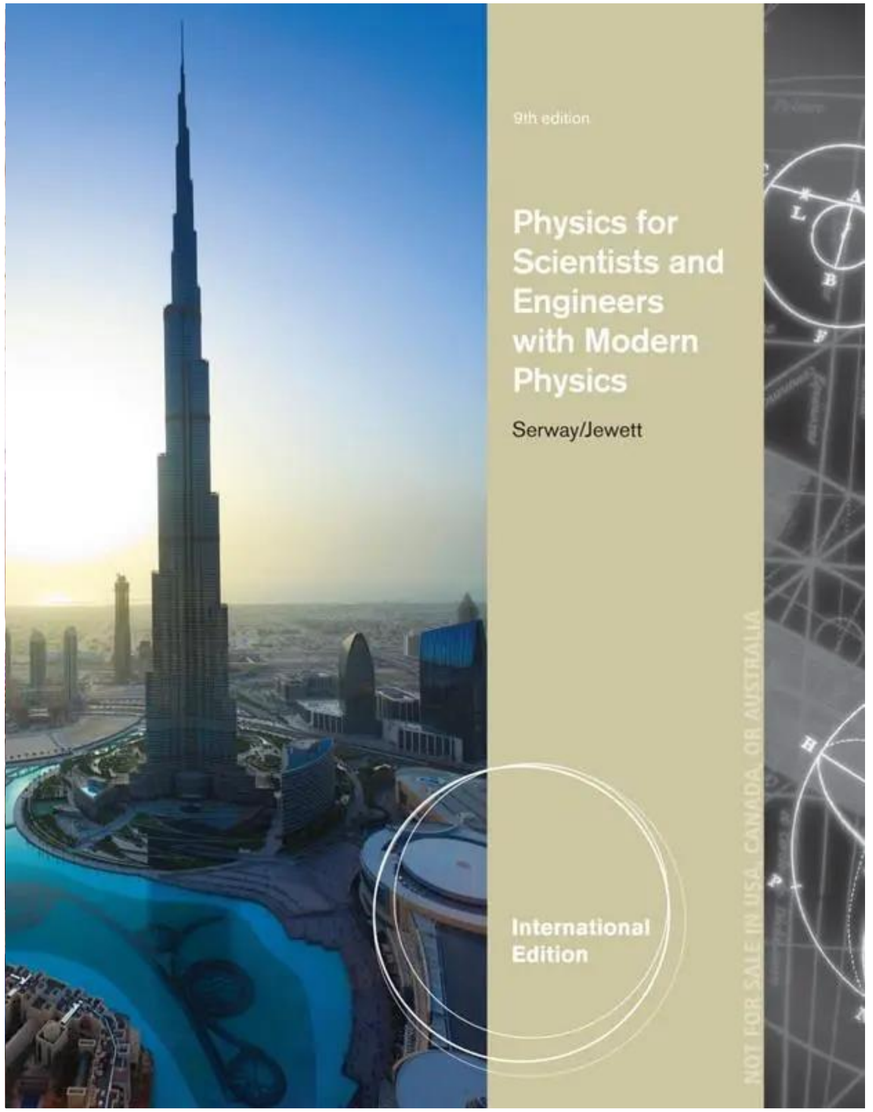

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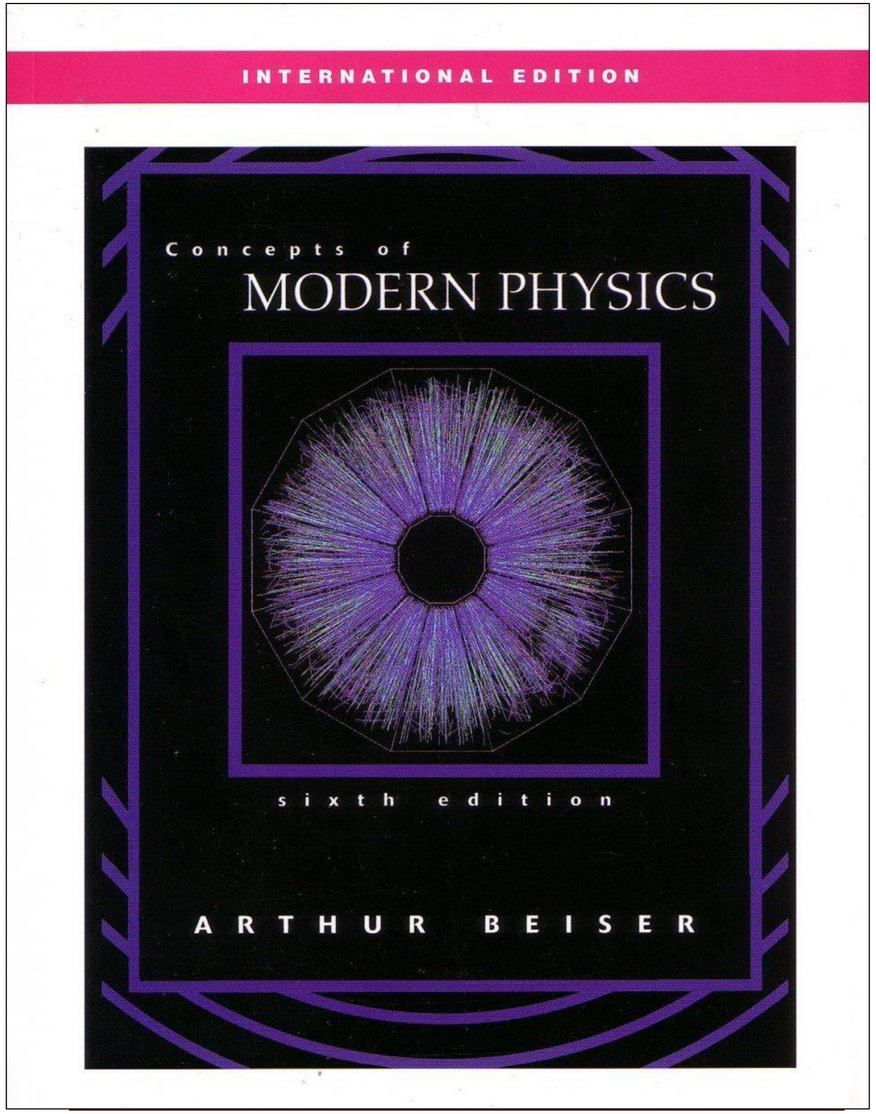

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COURSE MATERIALS

Online Supplementary Material

QuVis: Web site with quantum mechanics visualizations and simulations for educational purposes

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

PhET: collection of Interactive Simulations by the University of Colorado. See e.g. their Quantum tunneling of wave packets applet

Course on Modern Physics by Michael Fowler from the University of Virginia

Further course information on Michaël Barbier's webpage.

OVERVIEW OF THE COURSE

week	topic	
Week 1	Relativity	
Week 2	Waves and Particles	
Week 3	Wave packets and Uncertainty	
Week 4	The Schrödinger equation and Probability	
Week 5	**Midterm exam 1**	on Wednesday, March 19 at 10:45
Week 6	Quantum particles in a potential	
Week 7	Harmonic oscillator	
Week 8	Tunneling through a potential barrier	
Week 9	The hydrogen atom, absorption/emission spectra	
Week 10	**Midterm exam 2**	on Friday, April 25 at 8:45
Week 11	Many-electron atoms	
Week 12	Pauli-exclusion principle	
Week 13	Atomic bonds and molecules	
Week 14	Crystalline materials and energy band structure	

COURSE SYLLABUS AND CLASS WORKFLOW

Exams

- Midterm exam 1: 20 %
- Midterm exam 2: 20 %
- Final exam: 60 %

Examination Dates (tentative)

- Midterm exam 1: Wednesday, March 19 at 10:45
- Midterm exam 2: Friday, April 25 at 8:45
- Final exam: TBA