INSTITUTO DE FÍSICA "GLEB WATAGHIN"

PROGRAMA DE PÓS-GRADUAÇÃO EM FÍSICA

1º SEMESTRE DE 2018

FI119 - Física de Semicondutores (30 aulas duplas)

Turma
A

Créditos
4

Horário
Segunda e Quarta 8h às 10h na sala IF14

Docente
70271 - Luiz Eduardo Moreira Carvalho de Oliveira (Docente)

Ementa

1. Electrons in a periodic potential; calculation of electronic structure; density-funcional theory; molecular dynamics. Application to semiconductors; frozen-phonon approach; phonons-lattice dynamics/microscopic formulation; surfaces and interfaces

2. Effective-mass approximation: shallow/deep impurities, excitons; elementary excitations: plasmons, excitons, polarons, polaritons, magnons-spin waves, Cooper pairs, solitons/instantons

3. Linear response theory, screening and dielectric response; optical properties of semiconductors and low-dimensional semiconductor nanostructures; Coulomb-bound states in semiconductor nanostructures

4. A taste of spintronics: diluted magnetic semiconductors and hole-mediated ferromagnetism in $Ga_{1-x}Mn_xAs$; g-factor engineering. A flavor of quantum computing and Rabi oscillations

Tópicos especiais

1. pn, p-n-p (n-p-n) junctions, diodes, transistor, etc
2. Nobel 1986-Scanning tunnelling microscopy; atomic force microscope
3. Nobel 2014 - LED (Light-Emitting Diodes)
4. Mesoscopic Semiconductors
5. Organic semiconductors
6. Semiconductor lasers; semiconductor quantum-well lasers
7. Semiconductor quantum dots and applications
8. Landau quantization and magnetotransport in semiconductors
9. Density Functional Theory and the Gap Problem
10. XPS and ARPES

AVALIAÇÃO DOS ESTUDANTES NO CURSO:

seminários pelos alunos + paper ~ 4 pags, formato Phys. Rev., sobre tópico do seminário