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VIRTUTE ET SAPIENTIA

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DEPARTAMENTUL DE FIZICĂ TEORETICĂ, MATEMATICI, OPTICĂ, PLASMĂ, LASERI

Tematica și bibliografia postului de Conferențiar universitar, poziția 13

Discipline academice
- Interaction of laser radiation with matter/ Interacția radiației laser cu substanța
- Metode numerice în mecanica cuantică
- Quantum Electrodynamics / Electrodinamica cuantica
- Electrodinamica și Teoria relativității

Tematica de concurs
- Miscarea particulei incarcate electric in camp electromagnetic (descriere clasica/cuantica)
- Imprastierea radiatiei electromagnetice pe un electron (descriere clasica/cuantica)
- Functia de unda si densitatea de probabilitate de localizare pentru o particula in groapa de potential unidimensionala. Tunelare si rezonante.
- Functia de unda si densitatea de probabilitate de localizare pentru o particula in camp central
- Campul electromagnetic. Forma covarianta a legilor electromagnetismului. Functia Lagrange a campului electromagnetic. Cuantificarea campului electromagnetic. Conditiile Gupta-Bleuler. Propagatorul fotonic.
- Matricea S. Dezvoltarea in serie a matricii S. Diagrame Feynman. Reguli Feynman.
- Propagarea campului electromagnetic. Unde electromagnetice plane, proprietati. Legile reflexiei si refractiei. Coeficienti de reflexie si transmisie. Polarizarea undei plane monocromatice. Parametri Stokes.
- Elemente de cinematica relativista.Timpul propriu. 4-viteza, 4-acceleratia si proprietatile lor. Norme si relatii de transformare.

Bibliografie

1. K. Felix Mackenroth, *Quantum Radiation in Ultra-Intense Laser Pulses*, Springer, 2014
2. F. Mandl, *Introduction to quantum field theory*, John Wiley & Sons, 2013
3. W. Greiner et al., *Quantum Electrodynamics*, Springer, 2003
4. B.H. Bransden, C.J. Joachain, *Quantum Mechanics*, Prentice Hall, 2000
5. W.H. Press, S.A. Teukolsky, W.T. Vetterling and B.P. Flannery, *Numerical recipes: The art of scientific computing*, Cambridge University Press, 2007
6. C. Vrejoiu, *Electrodinamica si teoria relativitatii*, Editura didactica si pedagogica, Bucuresti,1993
7. J.D. Jackson , *Classical electrodynamics*, 3-rd ed., John Wiley & Sons, 1998

Director departament,
Prof. Dr. Virgil BĂRAN

DEPARTMENT OF THEORETICAL PHYSICS, MATHEMATICS, OPTICS, PLASMA, LASERS

Curricula and bibliography for the Associate professor position no. 13

Academic disciplines in the curricula:
- Interaction of laser radiation with matter
- Numerical methods in Quantum Mechanics
- Quantum Electrodynamics
- Electrodynamics and Theory of Relativity

Topics for job application procedures
- Motion of a charged particle in an electromagnetic field (classical/quantum description)
- Radiation scattering on an electron (classical/quantum description)
- The wave function and probability distribution for a particle in an one-dimensional potential well. Tunnelling and resonances.
- The wave function and probability distribution for a particle in central field.
- The electromagnetic field. The covariant form of the electromagnetism laws. The Lagrange function of the electromagnetic field. Quantization of the electromagnetic field. Gupta-Bleuler conditions. The photon propagator.
- The S matrix. Series expansion on the S matrix. Feynman diagrams. Feynman rules in quantum electrodynamics.
- Propagation of the electromagnetic field. Plane waves; properties. The laws of reflection and refraction. Transmission/reflection coefficients. Polarization of the electromagnetic plane wave. Stokes parameters.
- Elements of relativistic kinematics. The proper time, the 4-velocity, 4-acceleration and their properties.

Bibliography

8. K. Felix Mackenroth, *Quantum Radiation in Ultra-Intense Laser Pulses*, Springer, 2014
9. F. Mandl, *Introduction to quantum field theory*, John Wiley & Sons, 2013
10. W. Greiner et al., *Quantum Electrodynamics*, Springer, 2003
11. B.H. Bransden, C.J. Joachain, *Quantum Mechanics*, Prentice Hall, 2000
12. W.H. Press, S.A. Teukolsky, W.T. Vetterling and B.P. Flannery, *Numerical recipes: The art of scientific computing*, Cambridge University Press, 2007
13. C. Vrejoiu, *Electrodinamica si teoria relativitatii*, Editura didactica si pedagogica, Bucuresti,1993
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