

I. Conducator de doctorat: Lect.dr. Cosmin Crucean

II. Scurta descriere a domeniului de cercetare:

Teoria cuantica a campurilor pe spatii-timp curbate. Studiul solutiilor pentru campurile libere in diferite metrici. Calculul amplitudinilor de tranzitie folosind teoria perturbatiilor cu aplicatii legate de productia de particule in universul timpuriu.

III. Tema de cercetare pentru studiul doctoral si bibliografia aferenta:

Studiul productiei de bozoni masivi in universul timpuriu folosind metode perturbative.

1. S. Weinberg, The Quantum Theory of Fields (Cambridge University Press, Cambridge, 1995).

2. N. D. Birrel and P. C. W. Davies, Quantum Fields in Curved Space (Cambridge University Press, Cambridge 1982).

3. N. D. Birrel, P. C. W. Davies and L. H. Ford, J. Phys. A 13, 961 (1980).

4. C. Rubbia, Rev. Mod. Phys. 57, 699 (1985).

5. Ion I. Cotaescu, Gen.Rel.Grav. 42 ,861-876,2010.

6. J. Lankinen and I. Vilja, Phys. Rev. D 96, 105026-1 (2017).

7. C. Crucean, Eur. Phys. J. C 79:483, (2019).

IV. Teme propuse pentru proba de specialitate la admitere si bibliografia aferenta

1. Ecuatia lui Scrodinger pentru atomul de hidrogen

2. Teoria perturbatiilor stationare

3. Campul Dirac liber. Ecuatia lui Dirac si solutiile fundamentale.

4. Campul electromagnetic. Ecuatiile lui Maxwell si solutiile in unde plane

5. Teoria interactiunii dintre campul Dirac si campul electromagnetic

Bibliografie:

1 . S. Weinberg, The Quantum Theory of Fields (Cambridge University Press, Cambridge, 1995).

2. I. Cotaescu, Curs de mecanica cuantica, Tipografia Universitatii de Vest Timisoara.

3. J. D. Jackson , Classical Electrodynamics, (John Wiley and Sons Ltd. 1962);

4. W. Greiner, Classical Electrodynamics, (Springer 1998).

5. W. Greiner, J. Reinhardt , Field quantization, (Springer 1996).

I. PhD coordinator: Lect.dr. Cosmin Crucean

II.Short description of research domain:

The quantum field theory on curved space-times. Study of the solutions for the free field equations in various metrics. Computation of the transition amplitudes using the perturbation theory with applications related to the particle production in early universe.

III. Research theme for the PhD and bibliography :

Production of massive bosons in early universe using perturbative methods.

Bibliography:

- 1.S. Weinberg, The Quantum Theory of Fields (Cambridge University Press, Cambridge, 1995).**
- 2. N. D. Birrel and P. C. W. Davies, Quantum Fields in Curved Space (Cambridge University Press, Cambridge 1982).**
- 3.N. D. Birrel, P. C. W. Davies and L. H. Ford, J. Phys. A 13, 961 (1980).**
- 4. C. Rubbia, Rev. Mod. Phys. 57, 699 (1985).**
- 5. Ion I. Cotaescu, Gen.Rel.Grav. 42 ,861-876,2010.**
- 6. J. Lankinen and I. Vilja, Phys. Rev. D 96, 105026-1 (2017).**
- 7. C. Crucean, Eur. Phys. J. C 79:483, (2019).**

IV. Subjects for the PhD admission exam and bibliography

- 1. The Scrodinger equation for the hydrogen atom.**
- 2. The theory of stationary perturbations.**
- 3. The free Dirac field. The Dirac equation and fundamental solutions.**
- 4. The electromagnetic field . Maxwell equations and plane wave solutions.**
- 5. The theory of interaction between the Dirac field and electromagnetic field.**

Bibliography:

- 1 . S. Weinberg, The Quantum Theory of Fields (Cambridge University Press, Cambridge, 1995).**
- 2. I. Cotaescu, Curs de mecanica cuantica, Tipografia Universitatii de Vest Timisoara.**
- 3. J. D. Jackson , Classical Electrodynamics, (John Wiley and Sons Ltd. 1962);**
- 4. W. Greiner, Classical Electrodynamics, (Springer 1998).**
- 5. W. Greiner, J. Reinhardt , Field quantization, (Springer 1996).**