



Università degli Studi della Basilicata

DIPARTIMENTO DI MATEMATICA, INFORMATICA ED ECONOMIA

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COURSE: Modern Physics – Relativistic and Quantum Physics

ACADEMIC YEAR: 2019 / 2020

TYPE OF EDUCATIONAL ACTIVITY: Characterizing

TEACHER: D. Cocolicchio

e-mail:

website:

phone:

mobile (optional):

Language of Instruction: Italian

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ECTS: 6

n. of hours: 48

Campus: Potenza

Semester: II

DIPARTIMENTO DI MATEMATICA, INFORMATICA ED ECONOMIA

Corso di Laurea Triennale in Matematica

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#### EDUCATIONAL GOALS AND EXPECTED LEARNING OUTCOMES

**Course Outline and Contents:** This 6 credits theory physics-based course provides a broad introduction of the most recent discoveries in relativistic and quantum physics.

**Learning Outcomes:** This decennial course aims to crown the educational formation with the fundamental concepts of modern physics, focusing primarily on mathematical models and methods. All these tools are useful for students to expound the main issues of the most recent discoveries in physics.

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#### PRE-REQUIREMENTS

General Physics

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#### SYLLABUS

Classical Electro-Dynamics: Relativistic covariant formulation

Fundamentals of Quantum Theories

Mathematical Formulations of Quantum Mechanics

Semi-classical Theory of the Radiation-Matter Interactions

Atomic, Nuclear and Subnuclear Physics

Astrophysics and Cosmology

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#### TEACHING METHODS

**Teaching Methods and Tools:** Class lessons consist primarily of presenting relativistic and quantum physics concepts, and discussing modern discoveries. Key points are highlighted by means of a computer assisted approach, with solutions of examples in MatLab, MATHEMATICA and JAVA applets.

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#### EVALUATION METHODS

**Assessment Methods:** Oral examination is usually supplemented with a discussion of a homework report.

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#### TEXTBOOKS AND ON-LINE EDUCATIONAL MATERIAL

Although, this course is largely based on lecture notes, nevertheless, the following textbooks may be a useful completion.

- E. Merzbacher, *Quantum Mechanics*, (Wiley, 1997<sup>3Ed</sup>)

- R. Eisberg, R. Resnick, *Quantum Physics of Atoms, Molecules, Solids, Nuclei, Particles* (Wiley, 1985<sup>2Ed</sup>)

- J. J. Sakurai, *Advanced Quantum Mechanics*, (Addison-Wesley)

- R. Shankar, *Principle of Quantum Mechanics*, Plenum Press, New York, 1994

- D. J. Griffiths, *Introduction to Quantum Mechanics* (2<sup>nd</sup> Edition, 2004)

- D. J. Griffiths, *Introduction to Electrodynamics* (Prentice Hall Inc., 2<sup>nd</sup> Edition 1999)

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- M. Alonso, E. Finn, *Physics – Revised edition* (Addison-Wesley, 1992)
  - R. Eisberg, R. Resnick, *Quantum Physics of Atoms, Molecules, Solids, Nuclei, Particles* (Wiley, 1985 <sup>2Ed</sup>)
  - K. Krane, *Modern Physics*, (Wiley, 1996 <sup>2Ed</sup>)
  - J. Bernstein, P. Fishbane, S. Gasiorowicz, *Modern Physics*, (Prentice Hall, 2000)
  - R. Harris, *Nonclassical Physics*, (Addison Wesley, 1998)
  - F.J. Blatt, *Modern Physics*, (McGraw Hill, 1992)
  - S.T. Thornton, A. Rex, *Modern Physics for scientists and engineers*, (Saunders, 2000)
  - P. Tipler, R. Llewellyn, *Modern Physics* (3<sup>rd</sup> Ed.) Freeman
  - P. A. Tipler, *Corso di Fisica vol. 3*, (Zanichelli, 1995)

- [Visual Quantum Mechanics](#) at Kansas State University.
- [Computational Physics](#) at Oregon State University.

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INTERACTION WITH STUDENTS

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EXAMINATION SESSIONS (FORECAST)<sup>1</sup>

Month	Year	Day
March	2019	11
June	2019	17
July	2019	15
September	2019	16
October	2019	21
November	2019	25
December	2019	9

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SEMINARS BY EXTERNAL EXPERTS    YES     NO

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FURTHER INFORMATION

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<sup>1</sup> Subject to possible changes: check the web site for updates.