Università degli Studi della Basilicata

DIPARTIMENTO DI MATEMATICA, INFORMATICA ED ECONOMIA

COURSE: COMPLEMENTS OF RATIONAL MECHANICS

ACADEMIC YEAR: 2018-2019

TYPE OF EDUCATIONAL ACTIVITY: CHARACTERIZING

TEACHER: VITO ANTONIO CIMMELLI

e-mail: vito.cimmelli@unibas.it	website:
phone: 0971 205885	mobile (optional):

Language: Italian

ECTS: 6	n. of hours: 48	Campus: Potenza Dept: Di.M.I.E.	Semester: II

EDUCATIONAL GOALS AND EXPECTED LEARNING OUTCOMES

Knowledge: Basic knowledge of the fundamental principles of the relativistic dynamics, quantum mechanics and statistical physics.
Skills: Ability to analyze and compare different approaches to the physics of the early twentieth century.
Judging autonomy: The student must have clear and must be able to evaluate the difference between the various theories originally proposed for relativity and quantum mechanics.
Communicative Skills: The student must be able to briefly explain the fundamental laws of relativity and quantum mechanics and the basic concepts of kinetic theory of gases.
Learning Skills: The student must be able to read and understand basic texts of relativity, quantum mechanics and kinetic theory of gases.

PRE-REQUIREMENTS

Knowledge of the basic notions of Mathematical Analysis and vector calculus.
Ability to read simple texts of Mathematics written in English.

SYLLABUS

Galilean non-invariance of the Maxwell equations. Emissive theories, theories of ether, relativistic theories. Lorentz transformations and their consequences. Mathematical formulation of the principle of relativity. Minkowski universe. Relativistic equation of the particle dynamics. Kinetic energy and relativistic mass-energy equivalence.
The atomic structure of matter. The electron. The structure of the atom. The relationship between matter and radiation. The atomic mechanics of Bohr and Sommerfeld. Phenomenological theory of the quantum states. Limitations of the Bohr
and Sommerfeld theory. Wave mechanics. The uncertainty principle of Heisenberg and the wave-particle duality. Probabilistic interpretation of wave mechanics. The origins of quantum mechanics. The Schroedinger equation.
General information on classical statistical mechanics and kinetic theory of gases. The Maxwell law for velocity distribution of an ideal gas. Average value of the molecular physical quantities and energy equipartition theorem. Specific heats of perfect gases. Partition function. First and second law of thermodynamics.

TEACHING METHODS

Lectures and exercises, with collective periodic discussions.

EVALUATION METHODS

Oral examination.

TEXTBOOKS

S. Rionero, Lezioni di Meccanica Razionale, Liguori editore, Napoli, 2000.
R. Resnick, Introduzione alla relativit. ristretta, Casa editrice Ambrosiana, Milano, 1979.
E. Persico, Gli atomi e la loro energia, Zanichelli, Bologna, 1972.
E. Persico, Fondamenti della meccanica atomica, Zanichelli, Bologna, 1978.
M. W. Zemanski, Calore e Termodinamica, Zanichelli, Bologna, 1970.

INTERACTION WITH STUDENTS

Direct meetings, by appointment fixed by e -mail. Short communications, just to information, by telephone.
Office hours: Wednesday – 15:00-17:00
Potenza, University Campus of Macchia Romana, Building 3D, Department of Mathematics, Computer Science and Economics, room 3D254.

EXAMINATION SESSIONS

It can take exams every month, except August, after agreement with the teacher.

SEMINARS BY EXTERNAL EXPERTS YES □ NO X