



COURSE: MATHEMATICAL PHYSICS

ACADEMIC YEAR: 2018-2019

TYPE OF EDUCATIONAL ACTIVITY: CHARACTERIZING

TEACHER: VITO ANTONIO CIMMELLI

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Language: Italian

ECTS: 6

n. of hours: 48

Campus: Potenza
Deptl: Di.M.I.E.

Semester: II

EDUCATIONAL GOALS AND EXPECTED LEARNING OUTCOMES

Knowledge: Basic knowledge of the fundamental principles of mechanics of continuous systems and thermodynamics of irreversible processes.

Skills: Ability of application of mathematical methods of mechanics of continuous systems and thermodynamics of irreversible processes.

Judging autonomy: The student must have clear and must be able to evaluate the difference between the different approaches to thermodynamics of continuous systems.

Communicative Skills: The student must be able to explain concisely the fundamental laws of continuous physics.

Learning Ability: The student must be able to read and understand texts and research articles of continuous physics written in English.

PRE-REQUIREMENTS

Knowledge of the basic notions of Mathematical Analysis and vector calculus.
Experience in reading simple texts of Mathematics written in English.



SYLLABUS

Deformation of continuous systems. The deformation tensors. Kinematics of deformable continua.

Balance of mass, linear momentum and angular momentum. Constitutive equations.

Compressible and incompressible elastic solids. Perfect and viscous fluids. Initial and boundary value problems in fluid-mechanics and elasticity. First and second law of thermodynamics for continuous systems. Dissipation principle and exploitation of second law of thermodynamics. Rational Thermodynamics and method of Coleman-Noll for the exploitation of the entropy principle. Fourier, Cattaneo and Guyer-Krumhansl models of heat conduction. Thermodynamics with internal variables.

Classical and Extended Irreversible Thermodynamics. Rational Extended Thermodynamics.

TEACHING METHODS

Lectures and exercises, with collective periodic discussions.

EVALUATION METHODS

Oral examination and autonomous elaboration of a topic of continuum physics which is not included in the program of the course.

TEXTBOOKS

M. E. Gurtin. AN INTRODUCTION TO CONTINUUM MECHANICS. Academic Press, New York, 1981.

I-Shih Liu. CONTINUUM MECHANICS. Springer-Verlag, Berlin, 2002.

G. Lebon, D. Jou, J. Casas-Vazquez. UNDERSTANDING NONEQUILIBRIUM THERMODYNAMICS. Springer-Verlag, Berlin, 2008.

D. Jou, J. Casas-Vazquez, G. Lebon. EXTENDED IRREVERSIBLE THERMODYNAMICS, Fourth ed., Springer-Verlag, Berlin, 2010.

I. Muller, T. Ruggeri. RATIONAL EXTENDED THERMODYNAMICS, Second ed., Springer-Verlag, Berlin, 1998.

S. R. de Groot, P. Mazur, Nonequilibrium Thermodynamics, North Holland Pub. Co., Amsterdam, 1962. Ristampato da Dover Publications Inc., Mineola N.Y., 1984.



Università degli Studi della Basilicata

DIPARTIMENTO DI MATEMATICA, INFORMATICA ED ECONOMIA

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
