Università degli Studi della Basilicata
Scuola di Ingegneria

COURSE: Engineering transport phenomena			
ACADEMIC YEAR: 2018-2019			
TYPE OF EDUCATIONAL ACTIVITY: B			
TEACHER: Gianpaolo Ruocco			
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phone: x5454		mobile (optional):	
Language: italian/english			
ECTS: 9	n. of hours: 81	Campus: Potenza Dept./School: SI-Unibas Program: LM33	Semester: first

EDUCATIONAL GOALS AND EXPECTED LEARNING OUTCOMES

4-dimensional modelling is introduced, as a method and a tool to understand many situations that occur in both industrial and environmental process frameworks. Environmental flows in porous media, wind patterns around city buildings along with traffic pollutants, the thermal response of water-saturated substrates when subject to innovative processing, the formation of harmful compounds in bio-substrates, the colonization of bacteria or the progression of cancer: the applications of Transport Phenomena in our lives or in professional activities are endless. To this end, an introductory approach is provided which presents these topics through an orderly application of partial differential equations (PDEs), leading to the exploitation of mathematical fields through their analytical or numerical solution. Modeling of PDEs-driven phenomena has its inner workings that need to be recognized and understood. The final goal is that one can achieve a process virtualization, i.e. the replica of what we observe in the process reality and around us.

Nowadays, with the development of robust and efficient numerical techniques, the computation of interdependent Transport Phenomena is a valid tool to realistic process description. In a broad sense, the simultaneous existence of more mechanisms at once in the same process, cutting across the fields of physics, chemistry, mechanics, and biotechnology, can be called multiphysics.

PRE-REQUIREMENTS

None

SYLLABUS

In Part 1 the study of the discipline is introduced, with emphasis on the various modes of heat transfer as a multiphysics framework. In Part 2 to 5 we cover the bases of transport of quantities that are conserved in nature, from heat to chemical\biological species, through momentum. In the last part of the course we present a number of contemporary applicative cases.

TEACHING METHODS

The course consists in 48 h of theory lessons and 33 h subdivided as follows:

1. guided training in “ModProLab” laboratory;
2. the “Club” system, an innovative framework where each student will present his/her own preliminary results (Data Club), or will present those results as taken from the available literature of interest (Journal Club);
3. seminars/courses by experts/external teachers.

EVALUATION METHODS

Intermediate verifications, Final presentation and discussion of a modeling project, Oral examination.

TEXTBOOKS AND ON-LINE EDUCATIONAL MATERIAL

1. G. Ruocco, Introduction to Transport Phenomena Modeling, Springer International Publishing, Cham, 2018, ISBN 978-3-319-66820-8

2. Notes and hand-outs.

INTERACTION WITH STUDENTS

Students reception: on email appointment, every WED from 3pm to 7pm by the teacher's room at IVth floor, SI-Unibas building.

EXAMINATION SESSIONS (EXPECTED)[1]

23/03/2020, 11/05/2020, 06/07/2020, 12/10/2020, 14/12/2020

SEMINARS BY EXTERNAL EXPERTS YES

FURTHER INFORMATION

[1] Subject to possible changes: check the web site of the Teacher or the Department/School for updates.