University "G. d'Annunzio" of Chieti-Pescara
Department of Engineering and Geology
V.le Pindaro, 42 - 65127 Pescara (Italy)
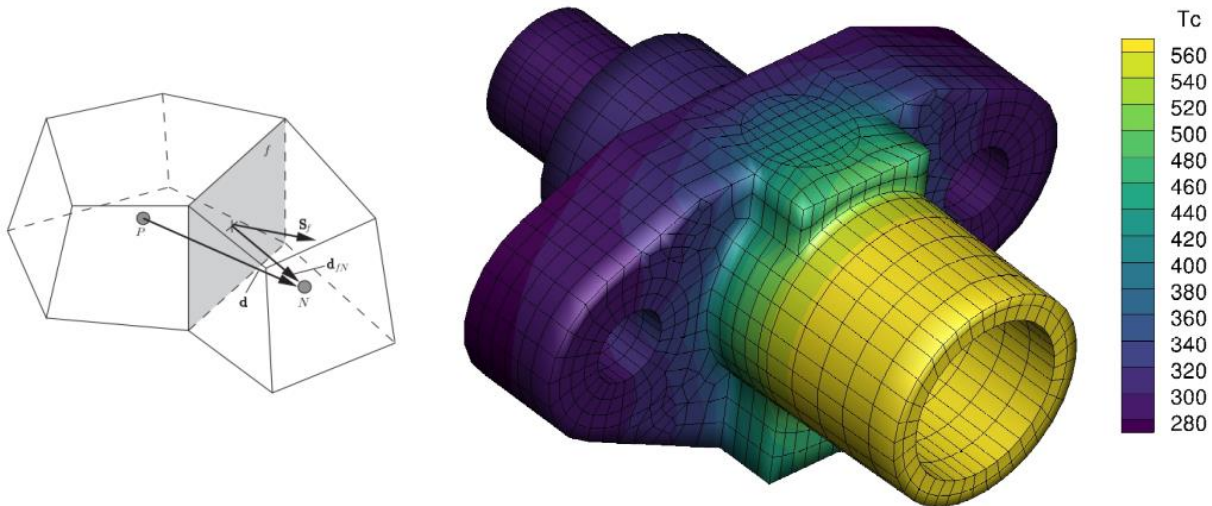
PhD Course in Engineering Science

Ud'A

Course announcement

Modelling of physical systems for engineering "Numerical Heat Transfer for Applications"

Dr. Matteo Falone

24 hours
Classes will be in English
Compulsory attendance

Each student is required to prepare a small project work. It can be a report concerning a code for the numerical solution of heat transfer problems treated during the course. Differently, it also possible to propose a small project to develop based on the tools discussed during the course.

Course program

1. Basics of heat transfer. Heat conduction equation. Extended surfaces. Bio–heat transfer. Laser heating of a biological tissue. Li–Ion battery thermal modelling.

2. Introduction to finite difference for steady state heat conduction: extended surfaces. Finite volume methods for Laplace equation. Unstructured grids, topological information. Grid geometric quantities. Non-orthogonal unstructured grids. OpenFOAM grid format. Explicit and implicit time integration strategies. Finite volume solution of Fourier equation. Introduction to linear systems computational solution techniques. Jacobi and Gauss-Siedel methods. Tri–diagonal matrix algorithm (Thomas algorithm). Preconditioned conjugate and bi–conjugate gradient methods (hints).

3. Applications: thermal modelling of extended surfaces for power electronic applications; bio–heat transfer in skin layer under laser heating.

Objectives

The aim of this course deal with is to provide some guidance in the numerical solution of heat transfer problems of practical engineering interest. Different numerical approximations will be discussed, to be considered acceptable and appropriate for solving a wide range of

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practical problems. Through class exercises will be also developed codes in MATLAB/Octave environment to solve the several problems. OpenFOAM library is adopted as reference for I/O format for finite volume applications.

✉ Register by sending email to:
matteo.falone@unich.it
For those not at University of Chieti-Pescara it is possible to follow the short course online: specify request when you register.

TIMETABLE			
Thursday	06/06/2024	3h	15-18
Friday	07/06/2024	3h	15-18
Monday	10/06/2024	3h	15-18
Thursday	13/06/2024	3h	15-18
Monday	17/06/2024	3h	15-18
Tuesday	18/06/2024	3h	15-18
Monday	24/06/2024	3h	15-18
Thursday	27/06/2024	3h	15-18