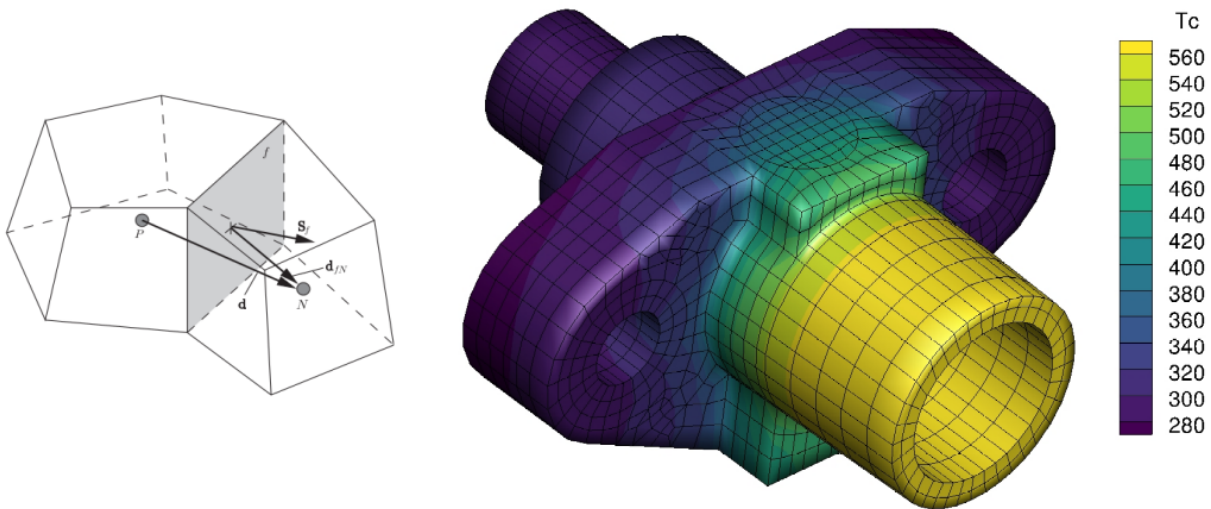


Course announcement
Modelling of physical systems for engineering
“Numerical Heat Transfer for Applications”
Ing. Valerio D’Alessandro



Hours 24 - cfu 3
Classes will be in English
Compulsory attendance

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

Detailed program:

- 1. Basics of heat transfer. Heat conduction equation. Extended surfaces. Bio-heat transfer. Laser heating of a biological tissue. Li-Ion battery thermal modeling. Lumped parameters modeling.*
- 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; photovoltaic cells thermal modelling in a nutshell.*

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

✉ **Register by** sending email to:

tea.taraborelli@unich.it & v.dalessandro@univpm.it

The lessons are held at Faculty of Engineering of Marche Polytechnic University – room 155/d1.

All the lessons can be followed through Microsoft Teams platforms. It is highly important to communicate the intention to attend virtually when you register at v.dalessandro@univpm.it

TIMETABLE		
Thursday	01/06/23	10:30–13:30
Tuesday	06/06/23	10:30–13:30
Thursday	08/06/23	10:30–13:30
Tuesday	20/06/23	10:30–13:30
Thursday	22/06/23	10:30–13:30
Thursday	29/06/23	10:30–13:30
Tuesday	04/07/23	10:30–13:30
Thursday	06/07/23	10:30–13:30