

# Contact Mechanics and Elements of Tribology

*Foreword to the 10th edition*

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@ Centre des Matériaux (& virtually)  
February 24, 2025



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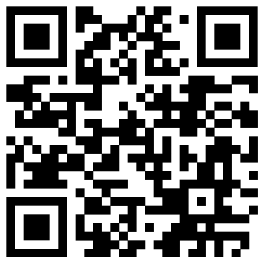
- Acquaintance
- Questionnaire
- Teaching team
- Course content
- Complexity of contact physics
- Notations



- **Siegfried Fouvry** (@CNRS, France) - Fretting and Wear
- **Pierre Arnaud** (@MINES, France) - Fretting wear, 3rd body & oxygenation
- **Eric Berger** (@Michelin, France) - Tribology of tyres
- **David Kammer** (@ETH Zurich, Switzerland) - Geophysics and fracture
- **Vladislav Yastrebov** (@CNRS, France)

# Please introduce yourself

Nominally 213 participants from 32 different countries  
Welcome questionnaire



<https://forms.gle/3zmR9o5EYQrq7s4G7>

# Zoom and operational mode

- We give this course in a hybrid mode, so please be patient with technical problems ☺.
- In case of such problems, please write in Zoom chat, we'll try to solve them asap.
- Please do not record the course, one day, I'll do it on my own ☺
- Please don't share zoom links neither. If someone would like to attend, please write me an email.
- During lectures, I'll accept oral question only from people in the classroom.
- For all Zoom participants, please write your questions in Google.Sheet  
<https://docs.google.com/spreadsheets/d/1vAvfcQ0aC1slBC8YgW8KUzdoWreLdt7d5X7a2o46p0/edit?usp=sharing>  
I'll try to address them asap.
- All slides will be available on [cmet.yastrebov.fr](http://cmet.yastrebov.fr)
- You can use all my figures and my slides (CC BY license) if you simply mention the author.

# Verify your attendance

- During the lecture or practical work, at random instance, I'll show you a QR-code and a link to let you verify your attendance.
- It will be available only for 3 minutes just to let you write your name and a password.

## Confirm Your Attendance

password: \*\*\*\*\*

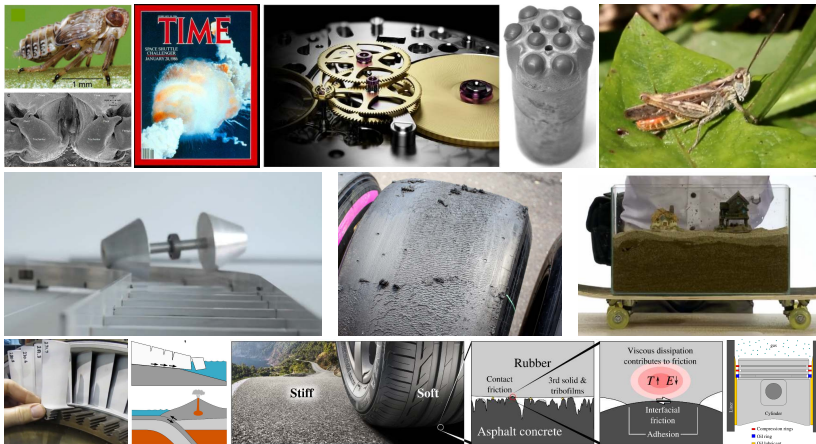
QR-code:



Link: [https://forms.gle/\\*\\*\\*\\*\\*](https://forms.gle/*****)

We try to keep theory / practice balanced

Prereading: [Applications](#)



# Exam, certificates & notes

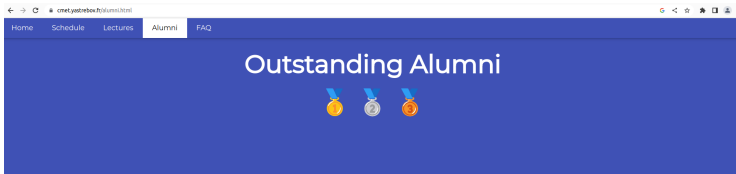
- On Friday, February 28th at 13h45.
- 20-25 questions on lectures of the first four days (Monday-Thursday)
- Duration: 2 hours 45 minutes
- Type of questions: technical questions which generally require some calculations
- Please take notes during the class, I give extra information on the "blackboard"
- You will be allowed to use whatever source of information you need, but not be helped by others or chatbots (ChatGPT, Bard, Mistral, etc) 😊
- The exam is "mandatory" for all the participants:
  - If you need a certificate of attendance. By the way to get it, you'll need to attend 7/8 lectures and practical sessions...
  - If you would like to try to get a certificate of excellence
- Final notes are essential for DMS participants to validate the course



Outstanding alumni receive a diploma and appear on the dedicated web-page ☺



Outstanding alumni receive a diploma and appear on the dedicated web-page ☺



## 2023

- Rihay DUQUESNE
- Amirhossein ZABIH
- Dayash-AZJUNA
- Samer SEMANN

## 2022

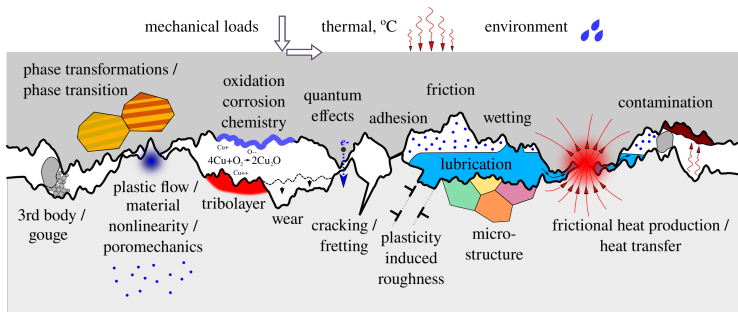
- António Manuel Couto Carneiro
- Quentin Caradec
- Rodrigo Pinto Carvalho
- AHYEE Amalor
- Victor Pivovarov
- Michon Audrey
- Pierre Gardier



# Contact complexity: physics and mathematics

## Particular difficulties related to contact problems: multiphysical aspects, mathematical aspects

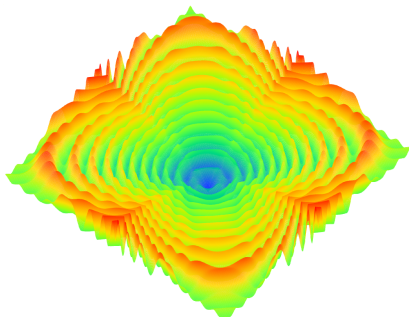
- Roughness of surfaces
- Interface chemistry
- Hardly accessible contact interface for measurements
- Generation and diffusion of heat
- Multiscale and multiphysical nature of friction



# Contact complexity: physics and mathematics

**Particular difficulties related to contact problems:**  
multiphysical aspects, **mathematical aspects**

- One of the most hard problems in mechanics
- Lack of standard optimization problem
- Non-convexity and non-differentiability
- Bad scalability





Welcome to the CMET course!

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