



Politecnico  
di Torino

PH.D. IN MECHANICAL ENGINEERING  
COURSE III LEVEL

THIN FILM AND GAS LUBRICATED-  
BEARINGS

## TEACHERS



**Jürg Schiffmann**

EPFL

**EPFL**



**Federico Colombo**

DIMEAS – POLITO



**June 2026**



**Politecnico di Torino**

### MODULE A – THIN FILM LUBRICATION AND NUMERICAL MODELS

Teacher: **Federico Colombo**

This module gives the fundamentals of lubrication theory for thin films and gives to students the possibility to develop numerical programs to solve simple problems.

- Derivation of Reynolds equations (theory)
- Hydrodynamic slider bearing (Matlab programming)
- Infinite-length journal bearing (Matlab programming)
- Finite length slider (Matlab programming)
- Finite length aerodynamic bearing (Matlab programming)

### COURSE PLAN

- WED 3 JUNE 08:30-11:30, ROOM 19
- TUE 9 JUNE 08:30-11:30, ROOM 6D
- WED 10 JUNE 08:30-11:30, ROOM 6D
- TUE 16 JUNE 08:30-11:30, ROOM 6D

### MODULE B – THIN FILM LUBRICATION AND NUMERICAL MODELS

Teacher: **Jürg Schiffmann**

The second module will focus on high-speed industrial gas bearing applications, particularly dynamic bearings, and will showcase recent developments in these components for microturbomachinery

- Dynamic grooved bearings
- Real gas effects
- Condensation
- Practical implementation of gas-lubricated bearings
- Rotordynamics

### COURSE PLAN

- THU 11 JUNE 08:30-11:30, ROOM 6D
- THU 11 JUNE 14:30-17:30, ROOM 6D
- FRI 12 JUNE 08:30-11:30, ROOM 6D
- FRI 12 JUNE 14:30-17:30, ROOM 6D

### BIO

**Federico Colombo** is Associate Professor at PoliT0, DIMEAS Department. His research at the LAQ-IBIS laboratory focuses on tribology and in particular on gas lubrication.

Recently, he focuses his research on dynamic gas bearings for high speed compressors (NODES project) with collaborations with APR and Carbomech companies.

**Jürg Schiffmann**, an Associate Professor at EPFL, leads the Laboratory for Applied Mechanical Design (LAMD). His research focuses on designing and testing reduced-scale turbomachinery, which enhances decentralized energy systems. Applications include small compressors for heat pumps and high-speed expanders for waste heat recovery via Organic Rankine Cycles. The design of such devices features high complexity, strong multidisciplinary aspects, and competing design goals. In addition to data-driven modeling, integrated mechanical design, and optimization methods, research also focuses on high-speed gas bearing technologies and their impact on both rotodynamic and aerodynamic aspects of small-scale turbomachinery.