

# **ROTOR DYNAMICS – a short course for Ph.D students**

**Giancarlo Genta – Politecnico di Torino**

Lectures: 12 hours

Laboratories: 4 hours

The aim of the course is clarify the basic concepts on the dynamics of rotating machinery and to deal with the modeling approach for simulating their behavior.

The basic concepts are dealt with using simplified models yielding a good physical insight on the subject and are also demonstrated in simple experiments on highly idealized devices.

Modeling of complex machines is then introduced using a finite element code allowing good quantitative prediction of the behavior of rotors.

Some aspects of the subject that are still subject of research rather than consolidated analysis practices will be also shortly dealt with.

## **Provisional timetable**

November 23	3 hours (8.30 – 11.30)
November 28	3 hours (8.30 – 11.30)
November 29	2 hours (8.30 – 10.30)
December 5	2 hours (8.30 – 10.30)
December 6	2 hours (8.30 – 10.30)
December 12	2 hours (8.30 – 10.30)
December 13	2 hours (8.30 – 10.30)

## **Detailed program**

### **Part 1: basic rotordynamics**

Vibrations of rotors: Campbell diagram, critical speeds and fields of instability. Undamped Jeffcott rotor. Damped Jeffcott rotor

Rotor with 4 degrees of freedom, gyroscopic effect.

Rotors on nonisotropic supports; rotors on hydrodynamic bearings.

Rotors with many degrees of freedom: simple FEM models in rotordynamics

### **Part 2: advanced rotordynamics**

Nonlinear effects in rotordynamics

Dynamics of nonisotropic machines

Solid FEM and multibody modeling in rotordynamics

### **Laboratories**

Experiments on physical demonstrators

Computer simulation of rotors