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# “Optical Measurements”

Master Degree in Engineering  
Automation-, Electronics-, Physics-,  
Telecommunication- Engineering



## Introduction to the Course and Logistical Information

prof. Cesare Svelto  
Politecnico di Milano

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# Professors and meetings

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- **Professor: Prof. Dr. Eng. Cesare SVELTO (PhD)**
  - ◇ cesare.svelto@polimi.it (**R-stud:**) 02 / 2399 3610
  - ◇ mobile. (for emergency) 320 / 42 19 245 or 340 / 97 61 929
  - ◇ <http://www.elet.polimi.it/upload/svelto/didattica>
- **Meetings with students:**
  - ◇ **Wednesday 10.30–12.30 hrs (inform of the visit)**  
or also in other days/times, with an appointment
  - ◇ e-mail: (*subject* **R-stud:** “topic”)
- **Assistant Professors:**
  - ◇ **Dr. Eng. Enrico RANDONE (PhD)**  
enrico.randone@unipv.it 347 / 85 48 507
  - ◇ **Dr. Eng. Alessandro PESATORI (PhD)**  
alessandro.pesatori@polimi.it 02 / 2399 3609

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# Didactic material

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- **Slides of the Course**
- **BOOK:** “Electro-Optical Instrumentation: Sensing and Measuring with Lasers”, S. Donati, Prentice Hall, 2004 (available at CLUP and Library)
- **Notes** (copies of previous students notes)
- Other didactical material and **exercises** (previous class-works with solved exercises): on the didactic WEB page **<http://home.dei.polimi.it/svelto/didattica/>**

*on the WEB site a previous register with detailed topics and dates of the lectures is available*

**Your COMMENTS are very welcome!**

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# Program of the Course (1/2)

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- **LASER sources**  
principles, properties, applications, safety
- **Light (Photo-) Detectors**  
direct and indirect photodetectors: measurement properties
- **LASER Telemeters**  
triangulators, Time-Of-Flight (*pulsed*/CW-mod), LIDAR
- **Interferometry**  
principles, limits, distance and velocity measurements, vibrometry, profilometry
- **Optical Gyroscopes**  
Sagnac effect, sensibility in terms of phase and frequency, *Ring Laser Gyro* (RLG) and *Fiber Optics Gyro* (FOG), properties and application fields, MEMS Gyro

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# Program of the Course (2/2)

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- **Optical Fiber Sensors**  
temperature, strain, electric current, magnetic field
- **LASER velocimeters**  
Doppler velocimetry, PIV and LDV, "autovelox"
- **Instruments for Optical Measurements in the Laboratory**  
*power-meter, wavemeter, CCD-camera, OSA, OTDR, insertion loss, BER, PMD, ...*

## MONOGRAPHIC TOPICS

- **Stability and Stabilization of LASER Oscillators**  
amplitude- and frequency- noise and its suppression
- **Ultra-High-Resolution Optical Measurements**  
high-resolution LASER spectroscopy  
detection of gravitational waves

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# Organization of the Course

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- The Course, counting **5 Credits (CFU)**, is articulated in **30 hrs LEZ (Lectures) and 20 hrs ESE (Exercitations)** and 3 hrs LAB (experimental Laboratory optional)
- **Detailed schedule of lectures and exercitations:**  
**Monday** 8.30–10.00 Room **D.1.2** (Via Golgi 40)  
**Wednesday** 8.30–10.00 Room **D.0.2** (Via Golgi 40)  
on demand from the students, a **pause** at about half lecture is possible
- **EXAMS**  
**NO intermediate exam** during the semester  
**written exam class-work** (typically 4 exercises in 2 hrs)  
**Exam Dates (“Appelli”)** (2+2+2=6) with the **option** of additional **oral interrogation** (on demand of the student or of the teacher)  
- option of **“freezing” votes...**  
*(exam class-works with solved problems available in the WEB)*



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**Let's START . . .**