Methodology for sciences (6 ECTS)

- **Research and communication project (bibliography project) : (2 ECTS)**

jury : *Catherine Schwob (INSP, SU), Jean-Hugues Fillion (MONARIS, SU)*

This module requires active involvement on the part of the students.
Students choose a scientific topic in collaboration with a researcher. Students are tasked with understanding the scientific issues and the research topic through bibliographical research and visits to the laboratory proposing the subject. They work very autonomously in monomials or pairs, and are the driving force in their interaction with the researcher.
This work gives rise to a report of a few pages in English, and a presentation in which the teaching effort must be significant.
The chosen subject is not intended to be the student's internship or thesis topic.

- **Pratical work (Optics, lasers) (2 ECTS)**

Optics (Polarization, modulation of light)

Teacher: *Catherine Schwob (INSP, SU)*

TP polarization :
- Generation of a linear polarization by transmission (polarisers) ou reflexion (Brewster)
- Study of birefringent plates (half-wave plate, quarter-wave plate)
- Measurement of the delay of an unknown plate

TP Electro-optics :
- Study of an electro-optical modulator (Pockels cell) without voltage, under continuous voltage, under sunisoidal voltage
- Transmission of sound with a laser beam

TP Acousto-optics :
- Study of the operating regimes of an acousto-optic modulator
- Theoretical study
- Obtaining diffraction
- Amplitude modulation - bandwidth
- Frequency modulation

Lasers

Teachers: *Thomas Zanon (MONARIS, SU), Laurent Coolen (INSP, SU), Alberto Bramati (LKB, SU), Valentina Parigi (LKB, SU)*

These practical works take place at Centre d'Instrumentation Laser (Jussieu)
They are strongly connected to the course « Lasers Physics ».

- Laser He-Ne:
    - Laser modes and Fabry-Perot cavity

    - Gaussian modes, injection of a laser beam into a cavity
- Laser Nd:YAG
    - Pumping by a laser diode and frequency doubling
    - Dynamics in lasers: pulsed laser (Q-switch) and relaxation oscillations
- Semi-conductor laser and detector
- Modes-locked pulse laser: pulse width, supercontinuum

Practical laser works are assessed by a practical test (TP exam).

- **IT Projet (Python) (2 ECTS)**

Teacher : *Thibaut Jacqmin (Laboratoire Kastler Brossel, SU)*