Title :High energy laser (CELIA Bordeaux)
Acronym : B1
UE coordinator : Joao Santos (UB)
Dimitri Batani, Alexis Casner, Frédéric Burgy, Clément Pejot, João Jorge Santos, Guillaume Duchateau, Emmanuel d'Humières : U. Bordeaux
Dates : February 13th – March 10th 2023
Duration : 4 weeks
Credits : 6 ECTS
Language : English
Inertial confinement fusion (8h lecture ; 4x 2h) Plasma diagnostics on Laser Mega Joule (4h lecture ; 2x 2h) Introduction to plasma diagnostics – Design constraints for LMJ or NIF – Focus on LMJ PETAL laser – ICF figure of merit and associated diagnostics – X-ray diagnostics. spectrometry, imaging visible range Diagnostics: backscattering, VISAR – nuclear diagnostics Intense lasers (6h lectures ; 3x 2h) Non linear effect in the laser chain – CPA stretcher-compressor scheme – laser diagnostics Practical work on Laser (4h of TP ; 2x2h per trinôme) Compression –regenerative amplifier– wavefront analysis Practical work on plasmas (5h of TP ; 2x 2.5h of TP per trinôme) Laser breakdown on solid target and gas – laser pump – probe experiment– Imaging and spatial filtering of ultrafast phenomena – laser absorption in a plasma – hydrodynamic expansion of a laser produced plasma. Practical work : Hydrodynamic- Radiative simulation (9h de TD machine ; 3x 3h) target implosion – Chocs – laser pulse shaping – ICF target gain Practical work : particle in cell (PIC) simulation (3h TP)

Title :Accelerator advanced technology (European accelerator school, JUAS)
Acronym : G1
UE coordinator : E. Metral (CERN)
Dates : February 13th – March 17th 2023
Duration : 5 weeks
Credits : 6 ECTS
Language : English
These lectures will be hosted in the Joint Universities accelerator school (JUAS) in Archamps, in the vicinity of the CERN. During 5 weeks lectures and practical works will be given on particle accelerators technology. visits of CERN accelerators, but also of the Paul Scherrer Institüt in Zurich and the BERGOZ instrumentation company will be proposed. - Radiofrequency engineering (including practical work) - Magnets (normal and superconducting) - Vacuums systems (including practical work) - Beams instrumentation - Particle sources - Accelerators for medical and industrial applications - low energy electron accelerators - High-power proton linacs - Radiation safety - life-cycle and operation of particle accelerators - Seminar (recovery linacs, accelerator driven systems) visit of PSI, CERN

Title : Tokamaks technology and research (IRFM Cadarache)
Acronym : C1-C2
UE coordinator : R. Guirley (CEA INSTN)
Dates : February 13th – February 24th 2023
Duration : 2 weeks
Credits : 6 ECTS
Language : English

Part 1 (two weeks): How to design a Tokamak ?

The main purpose of this module is to give to the students a sens of the interconnection between plasma physics, plasma-plasma facing component interaction, materials and superconductors. How to design a tokamak for a particular purpose. This practical work will be supervised by researchers of the IRFM institute.

Part 2 (two weeks) : experiments on tokamak

Practical work on research experiments, supervised by researchers and engineers of the IRFM institute. Each student will have to choose two subjets in the following list :

– robotic arm inspection of the plasma facing components.
– mode conversion for Lower Hybrid mode waves.
– Numerical modelling
– Thermomechanical qualification of plasma facing components
– Heat flux on tokamak edges : infrared thermography
– Superconducting magnet properties
– Contamination of plasma facing component– thermo-desorption analysis
– Remote experiment on the GOLEM tokamak (Prague)
– Data Analysis from COMPASS tokamak experiment (Prague)
– Data Analysis from WEST tokamak experiment (Cadarache)