Course modules

	Day 1	Day 2	Day 3	Day 4
9:00 — 10.30	Strain-rate sensitivity and testing equipment	Instrumentation and sensors	Advanced data elaboration	Tension tests realization (large machine)
	Coffee break	Coffee break	Coffee break	Coffee break
11.00 — 12.30	Hopkinson bar facilities	Simplified data elaboration	Tension tests realization (large machine)	Round table
	Lunch	Lunch	Lunch	
14.00 — 15.30	Unit presentation and ELSA labs tour	Compression tests realization (small machine)	Compression tests realization (large machine)	
	Coffee break	Coffee break	Coffee break	
16.00 — 17.30	Hopkinson bar typical structure	Design of Hopkinson experiments	Test Examples	

Strain-rate sensitivity and testing equipment (with focus on metals and geomaterials)

1. Strain-rate sensitivity of structural materials
2. Material models
3. Testing equipment for strain-rate sensitivity investigation

Hopkinson bar facilities

1. Hopkinson technique basics
2. Gas guns VS pre-tensioning method (wave length, calibration, pulse shaping, etc.)
3. Hopkinson bar configurations (compression, tension, torsion, tension-torsion, etc.)

Unit presentation and ELSA labs tour (Reaction Wall and Hoplab)

1. JRC and unit presentation
2. Reaction Wall tour
3. Hoplab tour

Hopkinson bar typical structure

1. Base frame
2. Gas-gun
3. Pre-tensioning and quick release system
4. Bars and bushings

Instrumentation and sensors

1. Strain-gages (ohmic, semiconductors)
2. Signal conditioning and acquisition
3. High speed cameras

4. Other sensors (accelerometers, lasers, etc.)

Simplified data elaboration

1. 1D wave propagation theory
2. Hopkinson formulae
3. Equilibrium check

Compression tests realization (small machine)

1. Test on metal specimen and elaboration with a conventional Hopkinson bar
2. Test on metal specimen (pulse shaping) and elaboration
3. Test on brittle specimen

Design of Hopkinson experiments

1. Design parameters of a Hopkinson test (bars material and diameter, specimen size, input wave length and amplitude)
2. Input wave amplitude prediction (gas gun and pre-tensioning)
3. Hopkinson experiment design tool

Advanced data elaboration

1. 3D wave propagation theory (dispersion)
2. Deconvolution algorithms
3. Data elaboration in non-standard conditions (short bars, bar of different materials and sizes)
4. Integration of DIC measurements

Tension tests realization (small machine)

1. Tests on metal specimen with a modified Hopkinson bar and data elaboration (low/high strain-rate)

Compression tests realization (large machine)

1. Test on concrete specimen with a large Hopkinson bar and data elaboration
2. Test on concrete specimen (pulse shaping) and data elaboration

Test Examples

1. Collection of different case studies and data collection of JRC experiments
2. Presentations of past Open Access projects at Hoplab

Tension tests realization (large machine)

1. Test on metal specimen with a large Hopkinson bar and data elaboration

Round table

1. Questions and answers