

Track (2nd year):
**Instrumentation and Measurement Science for Major Nuclear Research Facilities
(IMSci-Nu)**
2025-2029

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BCC (Skill Blocks)	ECTS	Units	ECTS	Modules	Hours	Total
Master the fundamentals of nuclear fusion and fission and major facilities associated	12	Fundamentals in nuclear fission and fusion	6	Nuclear Physics	14	42
				Radiation-Matter Interactions	7	
				Nuclear fission and fusion reactions	7	
				Plasma, material damage, heat transfer	14	
		Major nuclear facilities and challenges	6	Tokamaks	7	59.5
				ITER and DEMO	7	
				Research reactors and MTRs, JHR	7	
				SMRs, AMRs	7	
				Nuclear Power Plants	10.5	
				Reactor operating principle and control system	7	
				Reactor and tokamak experiments including TBM (Tritium breeding)	7	
				Other installations: accelerators, generators, ...	7	
Understand, select and implement instrumentation and detectors	12	Nuclear detection, instrumentation and fusion diagnostics 1	6	Sensors (general principles and metrological characteristics)	7	63
				Metrology	7	
				Radiation detection	7	
				Identification of sources of uncertainty	14	
				Non-destructive testing methods	10.5	
				Nuclear heating rate measurement	7	
				Principle of radioprotection	10.5	
		Nuclear detection, instrumentation and fusion diagnostics 2	6	Measurements and instrumentation under severe thermo-hydraulic conditions	10.5	42
				Qualifications and standards	7	
				Instrumentation for dismantling and remediation	10.5	
				Extreme constraints for tokamak measurement systems	7	
				Thermal measurements (properties, sensors, diagnostics)	7	
Carry out modeling and experiments	6	Modeling	3	Particle transport modeling (course)	7	24.5
				Particle transport modeling (practical)	7	
				Thermal and fluid modeling (course)	3.5	
				Thermal and fluid modeling (practical)	7	
		Experimental work	3	Practical work on major nuclear facilities (remote, 3D)	14	35
				Hands-on activities on detectors/sensors and associated simulations	21	
	30	Total S1	30			266

Conduct a project and communicate scientifically and internationally	12	Interculturality, international communication and scientific seminars	6	Interculturality, international communication	10.5	49
				Written and oral communication for internship and professional project	10.5	
				Scientific seminar series (winter school, remote, in-person)	28	
		Research project and case study	6	Research project with bibliographical, experimental and numerical activities	42	63
				Case study	21	
Professionalize in a scientific and international environment	18	Professionalization	18	Remote and in-person visits (industrial sites, major facilities in France and abroad, laboratories, platforms)	21	28
				Sharing apprenticeship experience	7	
				4 to 6 month internship on major facilities in France or abroad with thesis and oral presentation or apprenticeship with report and oral presentation		
	30	Total S2	30			140
	60	TOTAL M2	60			406