

INSA

INSTITUT NATIONAL
DES SCIENCES
APPLIQUÉES
CENTRE VAL DE LOIRE

Master of Applied Physics and Physics Engineering



Objective: to train students in the fields of

→ Instrumentation in relation with ultrasonic systems and their use for Non-Destructive Testing & Evaluation (CND & END) and, renewable energies and energy efficiency.

→ robotics, automatic and computer vision requiring the understanding of complex systems, robust and safe controls and the use of artificial intelligence.

Professionnal opportunities

**Doctoral studies in
public or private
laboratories**

System Engineering

**Project
Management**

**Renewable NRJ,
Instrumentation,
END / CND,
Ultrasounds.**

**Safety, Control
Loop, Cyber,
Mechatronic, Control,
Vision System.**

Content

Scientific topics: Applied mathematic, computer science, electronic, signal processing, automatic...

Soft skills: Behaviour in organisations, Scientific communication and professional English, French as foreign language.

Recruitment

M1: Bachelors in electricity science , electronic and automatics, physics, applied physics, mechanical and electrical engineering (courses are given in French).

M2: Engineers, international students, Erasmus.

Classroom: 24 students in M1 and in M2.

Research laboratories

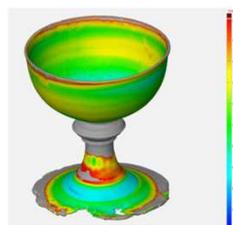
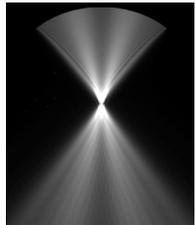
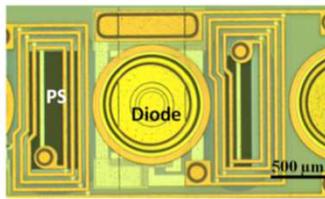
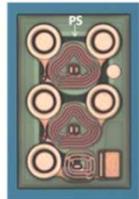


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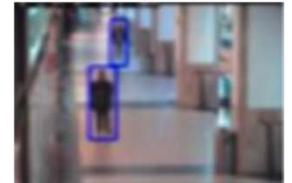
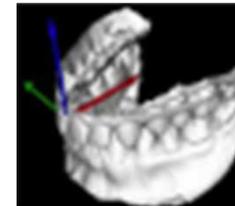
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Microelectronic, Transducers, Ultrasonic characterization, Micro and nano systems



Robotics, Automatic, Computer vision, Signal processing



Curriculum

Master 1



Master 2

Electronic,
Automatic,
Instrumentation,
Mechanics / Robotics

Track 1

Track 2

Electronics,
Instrumentation and
Ultrasound (EIU)

Automatic control,
Robotics and
Computer vision
(ARV)

Master 1 (S7 et S8, 580 h)

**Engineering
Sciences I and II**

**Mathematics
and Computer
Science**

**Physics and
Instrumentation**

**Soft Skills
Foreign
Language**

**Research
Project (200h)**

Master 2 : Track EIU (S9, 236 h)
courses are taught in English

Signal
Processing

Instrumentation
and Ultrasound

Renewable
Energies

Soft Skills and
Foreign Language

Internship
(S2, 4-5 months)

Master 2: Track ARV (S3, 237 h) courses are taught in English

**Vision and
Mechatronic**

**Advance Modeling
Systems**

**Soft Skills and
Foreign Language**

**Internship
(S2, 4-5 Months)**

M1 Courses

S7	Teaching Unit	Common Core	Lecture	Seminar	Lab Work	Project	Total	ECTS
	Engineering Sciences I	Programmable Circuits	10,66	10,66			21,32	16
		Robotics	10,66	10,66			21,32	
		Systems Engineering	10,66	10,66			21,32	
		Design of Experiments	10,66	10,66			21,32	
		Signals and Systems	10,66	10,66			21,32	
		Finite Elements	10,66	10,66			21,32	
	Computer science and maths	Non-linear Optimisation	10,66	10,66			21,32	8
		Object Oriented Language	10,66	10,66			21,32	
		Data Analysis and classification	10,66	10,66			21,32	
	Humanities	Risks, Labour and Environmental Law	10,66	10,66			21,32	3
		Project in Humanities				16	16,00	
	Languages	English / French as a Foreign Language		30		4	34,00	3
						Total S7	263,2	
S8	Teaching Unit	Common Core	Lecture	Seminar	Lab Work	Project	Total	ECTS
	Engineering Sciences II	Modeling and Control in State Space	10,66	10,66			21,32	6
		Communication, Systems and Transmission	10,66	10,66			21,32	
		Optimisation of Maintenance	10,66	10,66			21,32	
	Physics and Instrumentation	Vibration Dynamics	10,66	10,66			21,32	6
		Physics of Semiconductors	6	6			12	
		Instrumentation and Measurement Project				16	16	
	Project	DPP Project (Humanities)				4,66	4,66	18
		Research project 2 months				200	200,00	
						Total S8	317,94	

M2 Courses: Track Electronic, Instrumentation and Ultrasounds

S9	Teaching Unit	Track Electronic, Instrumentation and Ultrasound (EIU)	Lecture	Seminar	Lab Work	Projet	Total	ECTS
	Signal	Digital Filtering	8		8		16	4
		Stochastic Analysis	5,33	5,33			10,66	
	Ultrasound	Physical and Ultrasonic Acoustics	10	10			20	8
		Piezoelectric Materials and Ultrasonic Devices	12,5	12,5			25	
		MEMS and US Beamforming				12	12	
		Non Destructive Testing and Evaluation	8	8,67	8		24,67	
	Renewable Energies (RE)	Energy Recovery Systems	6,67	9,33	8		24	8
		Photovoltaic : Cells	6,67	6,67		12	25,34	
		Metrology and Sensors for RE	8	8	8		24	
	Bibliographic Search	Bibliographic Search	3			12	15	4
	Humanities	Professional Integration	2,66	1,33	4		8	3
		Labour Law	2,66	8			10,66	
	Languages	French as a Foreign Language (FFL) or Business English			21		21	3
						Total S9	236,33	
S10	Research and Development Internship (4 to 5 months)							30

M2 courses: Track Automatic, Robotics and Vision

S9	Teaching Unit	Track Automatic, Robotic and Vision	Lecture	Seminar	Lab Work	Project	Total	ECTS	
	Vision and Mechatronics	Advanced Automatic	10,5	10,5			21	10	
		Advanced Robotics	9	12	8		29		
		Computer Vision	12	9	8		29		
		Data Analysis and Artificial Intelligence	10,5	9			19,5		
	Advanced Systems Modeling	Modeling and Simulation of Critical Systems					24	24	10
		Vision and Machine Learning	10	10				20	
		Multi-physics Modeling	10	10				20	
		Dependability and Cyber Security	10	10				20	
	Bibliographic Search	Bibliographic Search	3				12	15	4
	Humanities	Professional Integration	2,66	1,33	4			8	3
		Labour Law	2,66	8				10,66	
	Languages	French as a Foreign Language (FFL) or Business English				21		21	3
							Total S9	237,16	
S10	Research and Development Internship (4 to 5 months)								30