UNIVERSITÉ DE NANTES

MASTER'S DEGREE **WIRELESS EMBEDDED TECHNOLOGIES**

(Second year in POLYTECH)

PROGRAM STRUCTURE (60 ECTS)

First Semester (30 ECTS) core program:

Program	Lecturers	Description	Hours	Credits
Models and Mathematics 923 17 MA 3 PHY UE 959 **[MoC]_** 923 17 MA 3 PHY EC 953	C. Bourlier	- Reminders on derivatives, primitives, limited developments, complex numbers - Vector operators (gradient, divergence, curl) in different coordinates - Operations on matrices: Addition, multiplication, inversion, Eigen values and vectors and introduction to decompositions (LU, QR, SVD, …) - Differential equations - Introduction to numerical methods	Lectures -10 Practice -6	4
Electromagnetics 923 17 MA 3 PHY UE 959 **[Elctromagn]_** 923 17 MA 3 PHY EC 954	T. Razban	- Maxwell's equations and limit conditions - Propagation in free space - Wave reflection - Guided propagation – Waveguides - Diffraction - Refraction	Lectures-15	3
Signal processing 923 17 MA 3 PHY UE 952 **[Signal1]_** 923 17 MA 3 PHY EC 951 **[Signal2]_** 913 17 MA 3 PHY EC 633	Y. Wang	- Reminders on filtering an pulse responses - Sampling, frequency alteration by symmetry and translation, Shannon theorem - Quantification: deterministic and random modeling, signal to noise ratio - Random signals: representation and characterization, real and complex signals - Discrete, continuous and stationary signals. Autocorrelation, spectrum density - Filtering of random signals	Lectures-30	5
Communicating object technologies 923 17 MA 3 PHY UE 970 **[Protocoles]_** 923 17 MA 3 PHY EC 961 **[ConsoFiab]_** 923 17 MA 3 PHY EC 964 **[OSEmb]_** 923 17 MA 3 PHY EC 968	J.F. Diouris, S. Pillement, A. Goullet	- Communication protocols (WiFi, BLE, Lora, Sigfox, Qovisio) - Circuit consumption control, MOS technology - DVFS techniques, idle time in processors, sequencing - Real time operating systems - Program architecture of embedded systems	Lectures-30	5
Architecture and methodologies for embedded systems 923 17 MA 3 PHY UE 1013 **[Architecture]_** 913 17 MA 3 PHY EC 1011 **[Methodo]_** 923 17 MA 3 PHY EC 1012	S. Le Nours, O. Pasquier	- Organization and material resource of embedded systems - Micro processors - Homogeneous and heterogeneous architectures - Different steps of digital circuit design - Language of material description - Use of digital circuit design tools	Lectures-24 Practice-6	5

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Tools and methodology for research 923 17 MA 3 PHY UE 1021 **[OutilsBiblio]_** 923 17 MA 3 PHY EC 1018 **[Biblio]_** 923 17 MA 3 PHY EC 1019	S. Pillement	- Use of LateX and BiBTeX - Bibliography methods in scientific research - Practical bibliography and oral presentation	Lectures-10 Practice-20	5
Innovation and entrepreneurship **[CLIP-MAVIE]_** *French language*		- Project management - Team management - Oral and written communication - Economy, business model - French language	Lectures-18 Practice-7	3

Second Semester (30 ECTS) stream and elective program:

Program (only one is chosen)	Lecturers	Description	Hours	Credits
Antenna and high frequencies 923 17 MA 4 PHY UE 1026 **[Antenne]_** 923 17 MA 4 PHY EC 1022 **[Hyper]_** 923 17 MA 4 PHY EC 1023	T. Razban	- Introduction of radiation parameters - Theoretical approach of the radiation - Wire, aperture and printed antennas - Antenna arrays - Introduction of propagation parameters - Scattering parameters - Passive HF circuit design - Active HF circuit design - Measurement techniques with network analyzer and anechoic chamber	Lectures -30	5
Digital Communications and antenna processing 923 17 MA 4 PHY UE 1034 **[TraitAnt]_** 923 17 MA 4 PHY EC 1029 **[CommAv]_** 923 17 MA 4 PHY EC 1031	J.F. Diouris Y. Wang	- Antenna arrays, space filtering - Techniques of Radiation pattern synthesis - Adaptive antennas - Estimation of directions of signal transmitters - Techniques based on Beam forming techniques - Techniques based on sub-spaces - Techniques based on estimation methods	Lectures -30	5

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Embedded systems 923 17 MA 4 PHY UE 1040 **[Conception]_** 923 17 MA 4 PHY EC 1036 **[LogEmb]_** 923 17 MA 4 PHY EC 1038	S. Le Nours J.L. Bechennec O. Pasquier	- Co-design principles - Models for representation of software-hardware architectures - Language principles for software-hardware architectures - Performance evaluation methods - Real time Operating Systems	Lectures -30	5

Internship for research project 923 17 MA 4 PHY UE 1042	Practice-5months	25