

**MASTER 2 - INTERNATIONAL ELECTROMECHANICAL HEART DISEASES**

Enseignement et contrôle des connaissances

2023-2024

SEMESTRE 1 - PROGRAMME PEDAGOGIQUE								
Blocs de connaissances et de compétences	Organisation pédagogique					Modalités de contrôle des connaissances et de compétences		
	ECTS	Cours Magistral (en h)	ED (en h)	Travaux pratiques (en h)	Travail personnel (en h)	Coefficient	Modalité	Durée
<b>UE 1 - Function, energetics and electrophysiology of the heart</b>	6	40	10	14		2	Ecrit	2h
<i>UE obligatoire</i> UE 1.1 - Mechanics of heart function studied at different integration levels: sub cellular, cellular, organ, entire organ UE 1.2 - Energy metabolism of the heart and energetics of heart contraction and relaxation UE 1.3 - Electrophysiology of the heart at different levels of integration: sub cellular, cellular and entire organ								
<b>UE 2 - Pathophysiological and pathological aspects of electromechanical heart diseases</b>	6	30	5	7		2	Ecrit	2h
<i>UE obligatoire</i> UE 2.1 - Pathophysiology/pathology of heart failure studied at different integration levels: sub cellular, cellular, organ, entire organism UE 2.2 - Pathophysiology/pathology of conduction disorders UE 2.3 - Pathophysiology/pathology of arrhythmia at different levels of integration: sub cellular, cellular and entire organ UE 2.4 - Interplay between heart failure, conduction disorders and arrhythmia in clinics								
<b>UE 3 - Biomedical engineering: cardiac signals, imaging &amp; devices</b>	6	45	10	30		2	Ecrit	1h
<i>UE obligatoire</i> UE 3.1 - <b>Signal</b> - Genesis of the biomedical electrical signal/ Processes of signal acquisition / One-dimensional time signal processing techniques /EP-lab equipment UE 3.2 - <b>Image</b> - Physical bases of image formation in each imaging modality/ Methods for image reconstruction /Advantages/limitations for each imaging modality for cardiac imaging UE 3.3 - <b>Data Sciences</b> - Theoretical multidimensional data/ Feature selection and classification/ Introduction to machine learning techniques								
<b>UE 4 - Therapeutics and devices for treatment of electromechanical heart diseases</b>	9	42	30	60		3	Oral	30 min
<i>UE obligatoire</i> UE 4.1 - X-ray based imaging techniques: medical imaging data infrastructures (PACS), post-processing image algorithms UE 4.2 - Electro-anatomical mapping in cardiac electrophysiology UE 4.3 - Pacing and defibrillation devices: algorithm design, arrhythmia discrimination, remote monitoring and deep-learning based secondary discrimination UE 4.4 - Left ventricular assistance devices: introductory fluid dynamics, extra-corporeal circulation, implanted assistance devices UE 4.5 - Congenital and Structural Percutaneous therapies: Cardiac anatomical and hemodynamic, biomaterials, regulatory and economical aspects of medical innovation								
<b>UE 5 - Economics of knowledge and innovation – Strategic watch and competitive intelligence</b>	3	12	15			1	Oral	1h
<i>UE obligatoire</i> UE 5.1 - Key concepts on innovation and knowledge economics UE 5.2 - Innovation strategy/project under technological and market constraints UE 5.3 - Competitive intelligence tools and interdisciplinary work.								
<b>TOTAL SEMESTRE 1</b>	<b>30</b>	<b>169</b>	<b>70</b>	<b>111</b>	<b>420</b>	<b>10</b>		
<i>Total CM + ED +TP + travail personnel = 770h</i>								
SEMESTRE 2 - STAGE								
	ECTS	Durée (en h)			Coefficient	Modalité	Durée	
<b>Stage obligatoire</b>	30	770			10			
- Evaluation pratique					0,2	En situation par le maître de stage		
- Mémoire					0,4	Rapport		
- Soutenance					0,4	Oral	30 min	
<b>TOTAL SEMESTRE 2 - 770h</b>								