IMAGE RECONSTRUCTION AND INVERSE PROBLEMS

ECTS	Cours (h)	T.D. (h)	T.P. (h)	Stage (semaines)
3	16			

Mention du master transmettant la fiche UE :	**IdS**
Composante de gestion de l'UE :	**Polytech**
Responsable de l'UE :	**FRIBOULET Denis ; denis.friboulet@creatis.insa-lyon.fr**
Statut du responsable :	**PR**

PROGRAMME DE L'UNITE D'ENSEIGNEMENT :

The objective of this course is to deepen students' knowledge of image reconstruction methods formulated as an inverse problem. Examples of applications include analytical and algebraic tomography methods, compressed sensing of signals, and more general methods of approaching so-called "hard" problems from the point of view of optimal resolution.

Enseignants :
Françoise PEYRIN : DR INSERM
Denis FRIBOULET : PU
Bernard ROUX

Modules:
1. Tomography
   a. Introduction to tomography imaging
   b. Radon Transform
   c. Position of the inverse problem of tomographic reconstruction
   d. Analytical methods of reconstruction, projection-slice theorem, implementation, artifacts
   e. Iterative methods and regularization
   f. Introduction to methods based on deep learning for tomography
2. Compressed sensing:
   a. Formulation: optimization under parsimony constraint
   b. Properties of the reconstruction: Restricted isometry and coherence
   c. Sparse representations: Bases, Frames, Dictionary Learning
   d. Application examples: Seismic Imaging, MRI, Ultrasonic imaging, Monopixel camera
   e. Beyond sparsity: Recent approaches using Deep Learning
3. Algorithmic of hard problems
   a. Complexity of problems
   b. Metaheuristics
   c. Hybridization and learning techniques
   d. Choice of parameters by planning of experiments

MUTUALISATION :